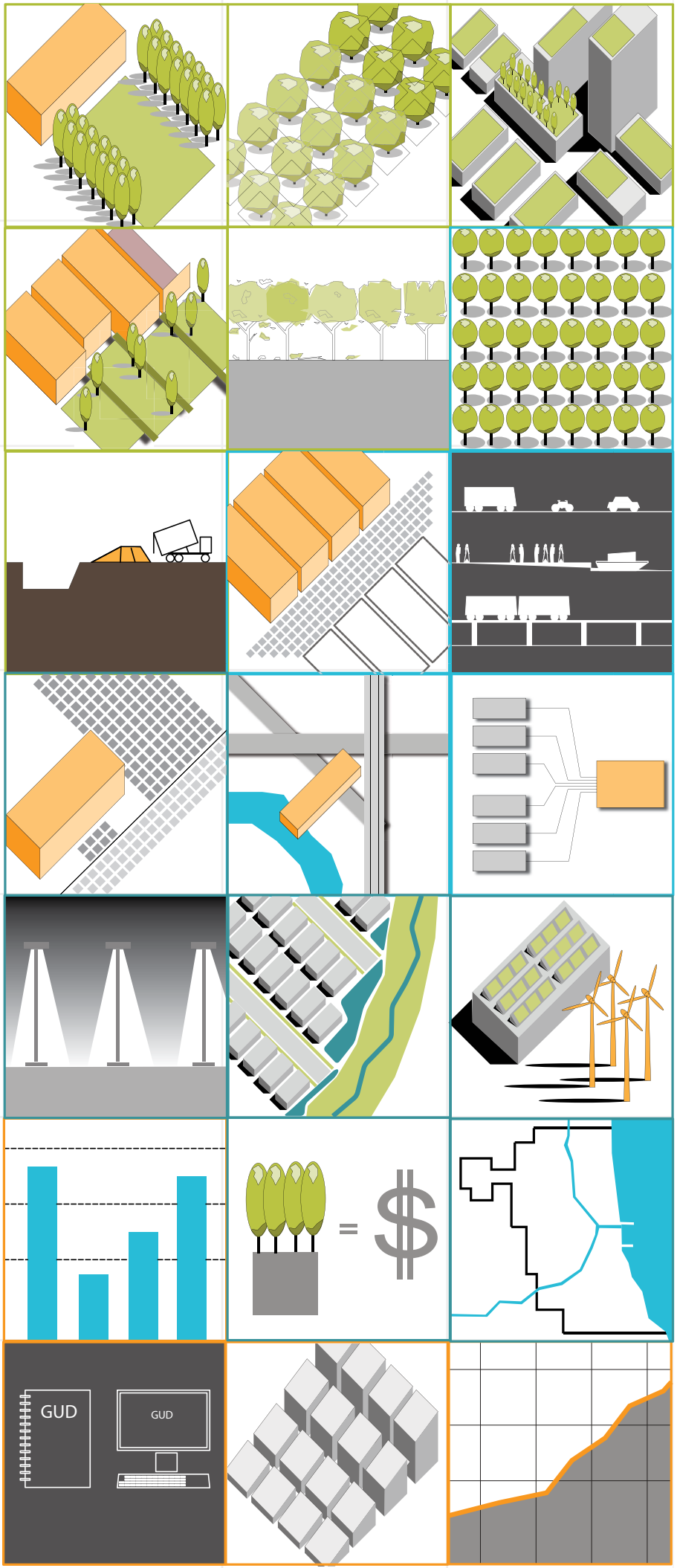



# ADDING GREEN TO URBAN DESIGN

## A CITY FOR US AND FUTURE GENERATIONS

*Icons designed by Peter Kindel of Topografis*

# **LETTER** FROM THE MAYOR

IT IS WITH PLEASURE THAT I INTRODUCE **ADDING GREEN TO URBAN DESIGN: A CITY FOR US AND FUTURE GENERATIONS.** This comprehensive plan builds upon the notion that densely developed cities like Chicago are the most environmentally responsible form of human settlement. It has been proven that compact, mixed-use, and dense cities like Chicago use resources more efficiently and their residents use public transit more often than their rural and suburban counterparts. To ensure this continues we want to improve the experience of city living by reducing the ability of parking lots to trap heat, creating places for stormwater other than people's basements and creating tree canopy throughout the city to help with both.

Over the past two years, eight City departments and over 50 professionals from outside city government have worked together to develop the 20 key strategies in this plan. The plan outlines how we can improve the design of all the areas of the city that are exposed to the environment like rooftops, building facades, landscaping around buildings and in parking lots, sidewalks, parkways and streets. Better design of these areas will lead to the achievement of the key environmental objectives of this plan, which are focused on preserving and enhancing the quality of our most valuable natural resources; water, air and land.

Following the roadmap outlined within will ensure that Chicago becomes the greenest City in North America for us and future generations.

Richard M. Daley, Mayor

# TABLE OF CONTENTS


**INTRODUCTION:**
THE PLAN 3

**CHAPTER ONE:**
THE RATIONALE 5
An Emerging View: Cities Embody Our Best Opportunity for a Sustainable Future 5
Implications for Chicago's Urban Design 6
Implications for Local Government 8

**CHAPTER TWO:**
THE GOAL, OBJECTIVES AND GREEN SOLUTIONS 9
Goal and Objectives 9
Water 10
Air 14
Land 18
Quality of Life 22

**CHAPTER THREE:**
APPROACH AND ACTION 25
Environmental 26
Integration 30
Innovation 34
Assessment 38

**APPENDICES** 41
Appendix 1: Implementation Road Map 41
Appendix 2: Glossary 56
Appendix 3: Bibliography and Online Resources 60
Appendix 4: Acknowledgments 65
Appendix 5: Endnotes 69

# INTRODUCTION: THE PLAN

**Adding Green** To Urban Design (Plan) presents a rationale, a vision and a detailed implementation strategy for economically sound and environmentally sustainable urban design.

Urban Design includes all exterior elements from the skin of the building to the street, including roofs, facades, yards, landscapes, open spaces, parkways, driveways, sidewalks, alleys and roadways. It is defined as those elements that are exposed to the environment and that affect the environment.

The Plan is intended to provide direction to the Chicago City Council in regulating urban design and to the Chicago Plan Commission in reviewing individual development projects. It is also expected to guide the Chicago City Council and city departments in making decisions about public investment and improving Chicago's built environment.

The Plan began with eight City departments and public agencies meeting to review existing ordinances and practices that affect urban design. The discussion was broadened into a public process between September 2006 and March 2007 to identify critical issues, suggest solutions and lay the groundwork for Green Urban Design. More than 50 professionals from outside City government contributed a combined 230 hours of pro bono time to the process. The participants are listed in Appendix 4.

## THE PLAN EXPLORES THREE PRIMARY QUESTIONS.

### WHY have a Plan?

Chapter 1 discusses the environmental benefits of urban density and explains government's role in encouraging sustainable urban development.

### WHAT needs to be done?

Chapter 2 presents the goal of Green Urban Design, objectives for water, air, land and quality of life and general green solutions.

### HOW can the Plan be implemented?

Chapter 3 presents the 21 specific actions including proposed ordinances, policies and processes that the City of Chicago and sister agencies should undertake to implement the green solutions.

The Appendices include a detailed implementation road map, glossary, endnotes, bibliography with online resources and acknowledgments. The implementation road map will be a fluid element of the plan that will be updated annually as strategies are implemented by the identified lead agencies.

# THE RATIONALE:
## CITIES ARE THE ANSWER, URBAN DESIGN IS THE TOOL

### AN EMERGING VIEW:
Cities are our best opportunity for a sustainable future

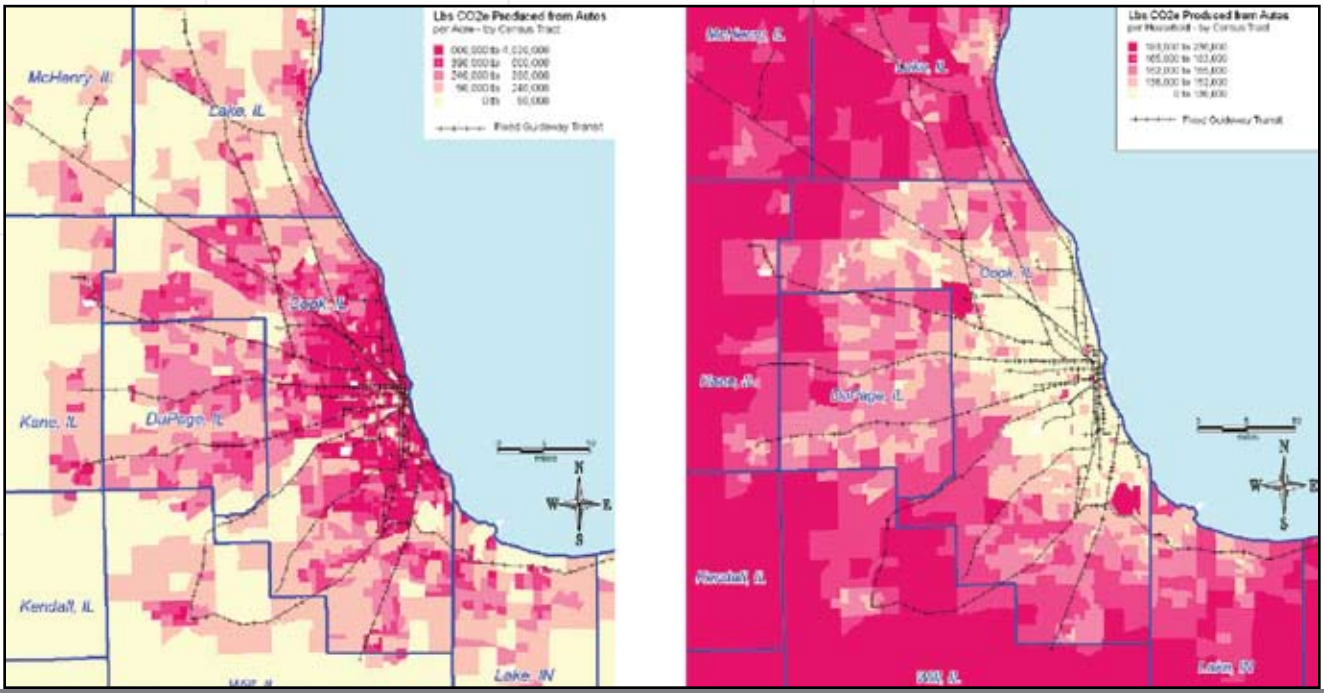
Over half of the world's population now lives in cities. [i] In Illinois, 22 percent of the State's population lives within the City of Chicago. [ii] Cities like Chicago have a critical role in the effort to improve the global environment.

Urban growth has been associated with polluted rivers, dirty air, contaminated lands and lost ecosystems. Cities have been portrayed as scary and dirty behemoths. Yet, recent studies on land use and population density show that cities are more environmentally friendly than their rural or suburban counterparts. [iii]

Compact, mixed-use, dense cities like Chicago use resources more efficiently than suburbs and rural areas. If Chicagoans lived at the typical American sprawl density of three households per residential acre, the city would require over 12 times more land to accommodate its residential neighborhoods. [iv] That figure does not include the land occupied by commercial, industrial and institutional uses.

With a wide mix of activities located throughout the city, a long-standing practice of providing sidewalks along streets and driveways and garages off alleys and a comprehensive mass transit network, many Chicagoans and visitors can travel on foot or via mass transit to reach their destinations. This results in reduced personal use of vehicles. On average, Chicago residents own fewer vehicles and drive fewer miles than their suburban neighbors. [See CNT graph below.]

TWO VIEWS OF THE CITY AND CARS (Source: Chicago Center for Neighborhood Technology)




TRADITIONAL VIEW: city dwellers produce large amount of greenhouse gases

EMERGING VIEW: city dwellers produce relatively low amount of greenhouse gases

## IMPLICATIONS FOR CHICAGO'S URBAN DESIGN

Retaining Chicago's urban form — compactness and density — is essential for the wise use of our land and energy resources. But the status quo will not make Chicago a 21st century sustainable city.

**CHICAGO LAND DISTRIBUTION & IMPERVIOUS COVER**

| LAND USE | % OF CITY SURFACE AREA | % IMPERVIOUS COVER |
|---|---|---|
| Residential | 50.3 | 55.1 |
| Manufacturing | 16.1 | 64.4 |
| Commercial | 2.9 | 79.0 |
| Public Open Space | 7.5 | 10.7 |

Spanning over 150 years, Chicago's development has resulted in thousands of acres of impervious surfaces such as rooftops, roads, sidewalks, parking lots and driveways. Those surfaces do not allow rainwater to soak into the ground. Today, close to 60 percent of Chicago's land area is either paved or covered with buildings, all designed to drain rainwater away as fast as possible. [v] This rainwater is sent to the combined sewer system where it is mixed with household and industrial sewage. During large rainfalls this combined system becomes overwhelmed and floods basements, streets and sends untreated sewage into the Chicago River. This combined system not only misuses valuable rainwater but also uses a substantial amount of energy to operate the infrastructure that conveys the combined rainwater and sewage to treatment facilities.

Chicago's paved areas and rooftops, often covered with dark-colored, heat-trapping materials such as asphalt, also result in increased surface temperatures, which can concentrate airborne pollutants. Pollution exacerbates heat stroke and respiratory diseases, such as asthma, which have serious impacts on residents' quality of life. [vi]

## HIGH AND LOW EMISSIONS SCENARIOS FOR CHICAGO

| HIGH EMISSIONS | LOW EMISSIONS |
|---|---|
| 10 degrees warmer under the high emissions scenario | 4 degrees warmer under the low emissions scenario. |
| Three times as many heavy precipitation events under the high emissions scenario | Almost twice as many heavy precipitation events under the low emissions scenario. |
| A shift of about one full climate zone every 30 years under the high emissions scenario. | A shift of half a climate zone every 30 years under the low emissions scenario. |
| By the year 2100, Chicago could feel like Texas or Alabama in the high emissions scenario. | In the low emissions scenario Chicago could feel like southern Illinois or Missouri. |

Researchers from the Department of Atmospheric Sciences, University of Illinois Department of Geosciences, and Texas Tech University have completed a model of projected climate changes. The model includes a low emissions scenario with projected lower emissions of greenhouse gases and high emissions scenario with projected higher emissions of greenhouse gases. Their research predicts climate changes in Chicago over the coming century (see box above).

Ongoing and expected future changes to Chicago's climate due to global warming will aggravate these issues. Chicago's built environment is going to be exposed to higher average temperatures with more intense and longer heat waves and a considerable increase in the number of heavy rainstorms. Appropriate design choices can maintain and improve Chicagoans' quality of life despite climate change.

Urban design can help lower greenhouse gas emissions that are causing global climate change. Providing for the needs of pedestrians, bicyclists and mass transit users will help reduce fossil fuel use by personal vehicles. Current design practices often make it difficult to leave the car at home. For example, narrow sidewalks exposed to the sun and access to buildings that is limited to driveways or parking lots discourage walking. Lack of dedicated bus lanes and safe bicycle routes discourages use of mass transit and bicycling. Green Urban Design choices encourage city users to take advantage of the mixed-use settings to walk, bike and use mass transit to get to their destinations.

The green urban design proposed in this Plan will enable Chicagoans to capitalize on the City's density. Chicago can demonstrate its stewardship of land, air and water resources now and into the future. A further discussion of the need to adapt Chicago's urban design for environmental stewardship and mitigation of the impacts of climate change can be found in Chapter 2.

## TAKING CHICAGO'S SUCCESSES TO THE NEXT LEVEL:
### Implications for local government

Green urban design is a powerful tool to improve cities and reduce their impact on the environment. It requires a paradigm shift accompanied by a comprehensive and coordinated approach from public and private stakeholders. In the past, protecting the environment primarily meant fighting poor urban design by stopping inappropriate projects from being constructed. Today, environmental stewardship affects all aspects of a construction project, including the building, landscape and site design.

Chicago is already a leader in Green Urban Design. A wide range of plans, ordinances, policies and programs are intended to make Chicago the "Greenest City in America." As a result, considerable progress has been achieved. More than 500,000 trees have been planted [vii] and the Chicago River's water quality has improved so that it sustains at least 60 fish species. [viii] Approximately 1,200 acres of public open space, much of it wetlands, [ix] have been added to Chicago's green infrastructure. More than 250 buildings with vegetated roofs have been built and another 350 are under construction or planned. [x]

While Chicago's green urban fabric has been enhanced in the past 20 years, other initiatives can be developed and implemented.

This Plan explores four approaches government can take to encourage sustainability. For environmental sustainability, government must provide comprehensive management with strong interdepartmental links, transparent systems, understandable regulations and clear accountability.

- Design and maintain to ensure environmental sustainability and function.
- Promote design that is responsive to the neighborhood context balancing functions, environmental goals and economic vitality.
- Test, evaluate and when appropriate expand use of and monitor green technologies.
- Empower all stakeholders at all times with an understanding of the rationale and outcomes.

The Plan articulates broad green solutions to achieve the goals and objectives discussed in Chapter 2. The specific implementation strategies for local government to create, support, guide and monitor sustainable urban development are discussed in Chapter 3 and Appendix 1.

# GOAL AND OBJECTIVES:

## THE PLAN'S GOAL AND OBJECTIVES ANSWER THE QUESTION "WHAT NEEDS TO BE DONE?"

### GOAL:

Maintain and improve Chicago's urban design to optimize its environmental benefits for current and future generations.

### OBJECTIVES:

→ WATER
Capture and use precipitation and encourage water conservation.

→ AIR:
Improve air quality.

LAND:
Preserve and expand the quality and function of vegetated surfaces.

QUALITY OF LIFE:
Improve safety and public health and engage people in the outdoor environment.

## KEY ISSUES AND GREEN SOLUTIONS

Based on an understanding of the **key issues** that Green Urban Design can address, **green solutions** provide broad direction to implement the Plan's goal and objectives. Details about specific implementation actions are discussed in Chapter 3 and the Appendix I.

# WATER OBJECTIVE:

CAPTURE AND USE PRECIPITATION AND ENCOURAGE WATER CONSERVATION.

# STORMWATER: "WHY DO BASEMENTS FLOOD SO OFTEN?"

## TOO MUCH WATER IS SENT TO CHICAGO'S COMBINED SEWER SYSTEM.

Ninety-eight percent of the City is served by a "combined" sewer system that conveys stormwater runoff and sewage in the same pipe to a treatment facility. [xi] Close to 60 percent of Chicago's land area is covered with surfaces such as rooftops and paved areas that do not allow water to infiltrate into the ground. [xii] During prolonged storms, the water runoff from paved areas can exceed the sewer conveyance and treatment capacities. This can result in surface ponding, flooded basements and sewage flowing into Chicago's river system. Since the water includes untreated sanitary waste, it can cause public health problems and serious ecosystem deterioration.

## EXPECTED CLIMATE CHANGE WILL INCREASE STORMWATER MANAGEMENT NEEDS.

The current amount of impervious surfaces already creates a problem for the combined sewer system. As a result of global climate change, summer rainfall will occur in more intense storms. The increased rainfall intensity, combined with the amount of impervious areas, may exceed the ability of Chicago's sewer system to handle the amount of stormwater that enters the system.

*The green roof on the Gary Comer Youth Center absorbs stormwater and provides an opportunity for students to learn about environmental stewardship.*

**GREEN SOLUTION:**
DESIGN TO REDUCE THE VOLUME AND RATE OF STORMWATER RUNOFF ENTERING THE COMBINED SEWER SYSTEM.

*This landscaped parkway was designed to collect stormwater from the sidewalk, sending less to Chicago's combined sewer system.*

Before

After

*These are before and after photographs of one of Chicago's green alleys. This alley off Rockwell was reconstructed using a permeable paver system. This new design improves the drainage by allowing the stormwater to infiltrate into the soils beneath the alley.*

# MUNICIPAL WATER: "WILL THERE BE ENOUGH WATER TO DRINK?"

## A SCARCE RESOURCE NEEDED FOR HUMAN CONSUMPTION IS USED FOR LANDSCAPE WATERING.

The Great Lakes contain 95 percent of the United States' surface fresh water supply. [xiii] The Great Lakes are used for drinking water in the City of Chicago and many communities in Illinois, Indiana, Wisconsin, Michigan, other states and Canada. Chicago pumps close to a billion gallons a day from Lake Michigan and less than 5 percent of this amount is returned to the lake. [xiv] It is estimated that half of residential water consumption goes to irrigation of lawns, gardens and trees.

## UNCERTAINTY OVER FUTURE WATER SUPPLY IN THE UNITED STATES IS LIKELY TO RESULT IN GREATER RESTRICTION OF CHICAGO'S LAKE WATER CONSUMPTION.

By 2025, two of every three people in the world will be facing water shortages. [xv] Chicago currently has an established water allocation from Lake Michigan, but that could change. Outside of the Great Lakes basin, water resources are vulnerable to climate change. Reduced water supply in other areas may increase the pressure to divert water from the Great Lakes.

## GREEN SOLUTION: DESIGN TO MINIMIZE POTABLE WATER CONSUMPTION.

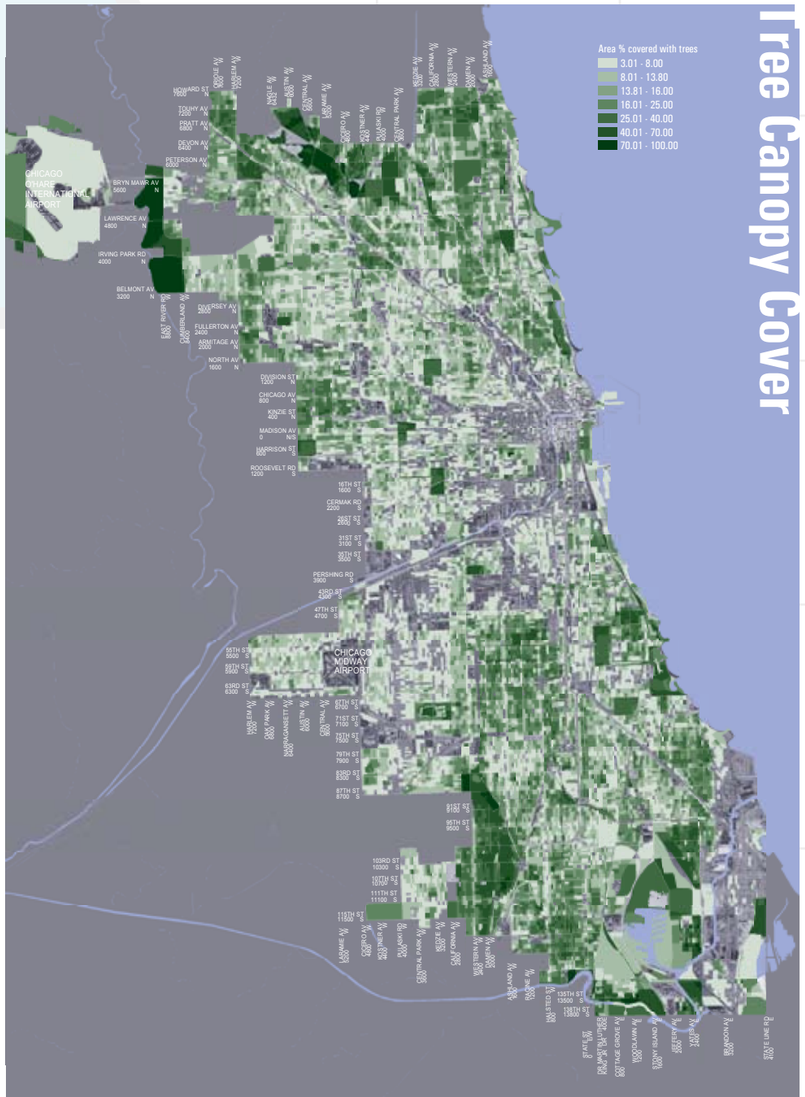
*This 12,000 gallon cistern at the Chicago Center for Green Technology (CCGT) is covered in blooming vines, collects stormwater from the roof and stores the water for landscape irrigation.*

# URBAN HEAT ISLANDS: "WHY IS IT SO HOT IN THE CITY?"

## LARGE AREAS OF DARK PAVEMENT AND ROOFTOPS AND LACK OF VEGETATION TURN THE CITY INTO AN OVEN.

Cities like Chicago have many dark-colored structures — roads, asphalt parking lots and asphalt rooftops — that absorb heat and reradiate it. This slows cooling at night. The result, called the Urban Heat Island Effect, increases temperatures 2 to 8 Fahrenheit degrees over those in surrounding rural areas. Urban Heat Islands also prolong and intensify heat waves in cities. The raised temperatures lead to increased air pollution levels and heat related illnesses and deaths.

Trees and other plants provide shade, which contributes to cooling the air and buildings. Lack of vegetation intensifies the Urban Heat Island effect, increasing the air temperature, which makes it increasingly difficult for plants to survive.




*This GIS map shows the percentage of tree canopy cover throughout the City. Darker shades of green signify higher percentages of canopy cover.*

## EXPECTED CLIMATE CHANGE WILL INCREASE THE NEED FOR COOLING.

Extreme heat is expected to occur more often, increasing the energy demand for building cooling. The extreme heat is likely to increase heat illnesses and deaths.

## GREEN SOLUTION: DESIGN TO REDUCE SURFACE TEMPERATURES.

*This recent photo of City Hall's green roof clearly shows the contrast between a vegetated and non-vegetated roof. The temperature differences between a vegetated and non-vegetated roof can be as much as 70 degrees.*

### MONUMENTAL INFRASTRUCTURE IMPROVEMENT WILL NOT SOLVE ALL PROBLEMS.

To preserve its natural water bodies, Chicago has relied on massive engineering work. In 1900 the construction of the Chicago Sanitary and Ship Canal reversed the flow of the Chicago River, taking wastewater away from Lake Michigan. Over 70 years later, Chicago was facing major pollution due to releases of untreated sewage into the rivers. The Metropolitan Water Reclamation District of Greater Chicago began the construction of the Tunnel and Reservoir Program (TARP). TARP consists of deep rock tunnels and surface reservoirs that convey and store combined sewage during storms. After a storm, combined sewage is sent to the treatment plant. TARP is expected to be completed by 2018.

# NATURAL WATER BODIES:
## "IS IT SAFE TO SWIM IN THE RIVERS AND LAKES?"

### THE INTENSITY OF FUTURE SUMMER STORMS MAY INCREASE WATER POLLUTION IN THE RIVERS.

Today, numerous sections in the network of sewer pipes limit the capacity of Chicago's sewer system. The cost of replacing all local sewer lines with larger ones would be prohibitive. Since more intense summer rainstorms are expected due to climate change, even when TARP is fully completed it will not eliminate the combined sewer overflow into the rivers.

## GREEN SOLUTION:
DESIGN TO PROTECT AND ENHANCE CHICAGO'S NATURAL AND MAN-MADE WATER BODIES (LAKES, RIVERS, WETLANDS, LAGOONS AND GROUNDWATER).

*This new Planned Development on the south branch of the Chicago River constructed a riverwalk path landscaped entirely with native plants. The project also includes bioswales, permeable pavers, and a wetland detention basin planted with native wetland plants.*

*All of the stormwater from the roof and parking lots is directed to the river via bioswales and the wetland detention basin. This project provides important habitat for river-edge wildlife and a scenic pathway for residents.*

*The City of Chicago and the US Army Corps of Engineers restored the riverbank at Northside College Preparatory School to include native plantings, waterline armoring, viewing platform, and solar power lighting along the riverwalk.*

# AIR OBJECTIVE:

IMPROVE AIR QUALITY.

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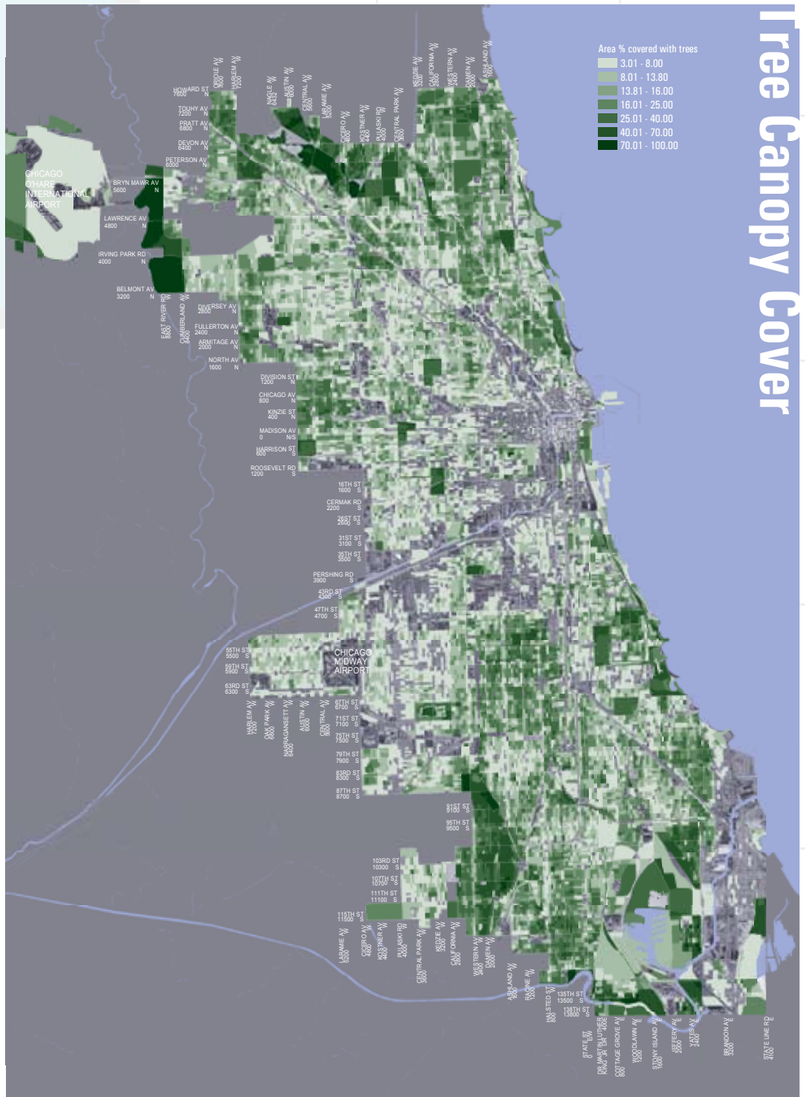


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*This recent photo of City Hall's green roof clearly shows the contrast between a vegetated and non-vegetated roof. The temperature differences between a vegetated and non-vegetated roof can be as much as 70 degrees.*

# AIR POLLUTANTS: "HOW DO CITIES POLLUTE THE AIR?"

## CONDITIONS IN CITIES CREATE OZONE AT GROUND LEVEL WHERE PEOPLE BREATHE IT.

Ozone ($O_3$) is the primary ingredient of smog and is harmful to breathe. Ozone is one of the most deadly types of air pollution. It attacks lung tissue by reacting chemically with it. Scientists are discovering how dangerous ozone is, particularly to people with pre-existing respiratory diseases, such as asthma.

Ozone is formed by chemical reactions in the atmosphere from two gases that come from tailpipes, smokestacks and other sources. These gases are nitrogen oxides (NOx) and volatile organic compounds. They are produced when fossil fuels, like gasoline or coal, are burned. When these gases are exposed to heat and sunlight, they form ozone. The amount of ozone increases as the temperature increases, especially over 70 Fahrenheit degrees.

## EXPECTED CLIMATE CHANGE WILL INCREASE THE NUMBER OF HIGH-TEMPERATURE DAYS RESULTING IN INCREASED OZONE-RELATED HEALTH PROBLEMS.

Hotter air in cities increases the frequency and intensity of ground-level ozone. Chicago is among the cities classified as severe ozone non-attainment areas. From 1990 through 2006 Chicago had 157 "code orange" days or high air pollution days. [xvii] Chicago ranks 20th among "Most Ozone-Polluted Cities." [xviii]

*In 2007, the Chicago Park District replaced 8 diesel lawn mowers with new propane mowers that reduce harmful emissions from their maintenance operations.*

**GREEN SOLUTION:**
DESIGN TO MINIMIZE THE CONTRIBUTION TO POLLUTION FROM EMISSIONS AND CONSTRUCTION.

## OZONE CAUSES HEALTH PROBLEMS.

Exposure to ground-level ozone during summer can cause health problems. These problems include: shortness of breath; chest pain when inhaling deeply; wheezing, coughing and pulmonary inflammation. Exposure to ozone also increases susceptibility to respiratory infections, asthma attacks and the risk of premature death.

The asthma hospitalization rate in Chicago is nearly double the national average. Also, the asthma prevalence in Chicago is slightly higher than the nation overall and that increase can be seen across racial and ethnic groups. [xvi]

# URBAN TRANSPORTATION SYSTEM:
## "WHY DON'T PEOPLE WALK OR BIKE MORE OFTEN?"

### IN CHICAGO, SOME STREETS AND SITE DESIGNS MAKE IT UNPLEASANT OR UNSAFE TO WALK OR BIKE. MORE CARS ON THE ROAD PRODUCE MORE AIR POLLUTION.

People are uncomfortable biking on wide streets with high-speed, high-volume traffic. In the winter, snow may be plowed onto bike lanes. Bicycle storage is difficult. Narrow sidewalks with no trees and shade are not inviting places to walk. In areas with buildings that are set too far back from the sidewalk and where access is only from parking lots or driveways, it is difficult to walk.

**GREEN SOLUTION:**
DESIGN TO PROTECT, ENHANCE AND BUILD UPON THE EXISTING INFRASTRUCTURE OF THE MASS TRANSIT, WALKING AND BIKING SYSTEMS.

*With its large shade trees, decorative but also permeable pavers, and outdoor cafés, Roscoe Street provides an environmentally functional and inviting streetscape for pedestrians.*

# ENERGY: "ARE THERE WAYS TO USE ENERGY MORE EFFICIENTLY?"

### ALL ENERGY USERS SHOULD BE ENCOURAGED TO MAXIMIZE EFFICIENCY WITH A FOCUS ON THE BIGGEST ENERGY USERS.

Pumping and treating wastewater represent the largest energy use in Chicago. Most of the wastewater sent to the region's water treatment plants is actually rain water that is conveyed to the treatment plants through the combined sewer system. Instead of being allowed to percolate into the ground, rain water flows over all of the City's paved areas and rooftops and into the combined system.

### EXPECTED CLIMATE CHANGE BRINGS HOTTER DAYS AND INCREASING RAINFALL.

The energy used to pump and treat rain water will increase as will the energy needed to cool buildings.

**GREEN SOLUTION:**
DESIGN TO MINIMIZE ENERGY REQUIRED FOR PUMPING AND TREATING RAIN WATER AND FOR COOLING BUILDINGS.

# LAND OBJECTIVE:

PRESERVE AND EXPAND THE QUALITY AND FUNCTION OF VEGETATED SURFACES.

## SOIL: "WHY ARE THOSE TREES ALONG THE STREET DEAD?"

### URBAN SOILS ARE CONTINUALLY DISTURBED AND THUS ARE MORE LIKELY TO NEED STRUCTURAL MODIFICATION TO SUSTAIN PLANT GROWTH.

Urban trees often have most of their roots under pavement and die prematurely. It is estimated that an urban tree lives for an average of only seven to 10 years. With better soil conditions the tree may be expected to live at least 50 years.

In the urban environment, soils are often compacted, mixed with fill and covered with concrete. Compacted soils are less effective at soaking up water and nutrients as the soil particles are closer together, with less space for water or air. Compacted soils may prevent roots from growing, since the roots are contained within a small volume of soil without adequate water, nutrients or oxygen.

Conventional landscape practices also harm urban soil as the removal of fallen leaves and excess thatch deprives the soil of the nutrients in organic matter that promote plant growth. Also as organic matter breaks down, it forms humus, which maintains a loose soil that does not compact easily .

### THE ROLE OF SOILS IN THE ENVIRONMENT IS OVERLOOKED.

Soil, air and water are the basic elements for the existence of people and plants. Soil is a natural filter for air pollution. Various kinds of pollutants, including $CO_2$, are trapped, so they do not enter the ground water or circulate in the air. With increased fossil fuel combustion, higher levels of nitrogen in the soil may reduce the soil's ability to sustain plant life.

*The landscaped area in the Mercy Home parking lot on the Near West Side provides enough soil volume to allow the trees to grow to their tree canopy potential.*

## PLANT DIVERSITY AND SUSTAINABILITY: "WHY ARE WEEDS GROWING THERE INSTEAD OF GRASS?"

**GREEN SOLUTION:**
DESIGN TO PROTECT, EXPAND AND IMPROVE THE QUALITY AND FUNCTION OF VEGETATED SURFACES AND THEIR GROWING MEDIA.

### GRASS IS NOT AN ENVIRONMENT-FRIENDLY CHOICE.

Plant selection should include a variety of plants, such as prairie grasses, that can thrive without mowing and with minimal water. High-maintenance plants such as Kentucky bluegrass, which is used in so many lawns, require frequent mowing, weeding and watering. The mowing contributes $CO_2$ to the atmosphere and the watering reduces the supply available for drinking.

### EXPECTED CLIMATE CHANGE MAY IMPACT HOW MANY SPECIES WILL THRIVE IN THE CITY.

Chicago's climate zone is predicted to change by one-half to one climate zone so the City's climate will be similar to Missouri or to Texas. Some trees, such as the State's native tree, the white oak, may no longer thrive in Chicago. The number of plant species in the City may decline.

**GREEN SOLUTION:**
DESIGN TO EXPAND DIVERSITY OF PLANT TYPE AND AGE AND PROVIDE PLANTS WITH THE RIGHT SPACES TO GROW.

*This landscaped area in the front of the Chicago Christian Industrial League Headquarters combines permeable hardscape areas with landscapes planted with hearty, drought-tolerant perennials, maximizing the site's ability to absorb stormwater and the diversity of its landscape.*

## URBAN FOREST: "WHY IS THAT BLOCK MORE ATTRACTIVE THAN OTHER BLOCKS?"

### TREES BENEFIT THE CITY IN MANY WAYS.

Benefits of trees include: aesthetic appeal, calming traffic and reducing street noise. Trees also shade buildings from summer sun and winter heat, which helps to reduce energy consumption.

**GREEN SOLUTION:**
DESIGN TO PRESERVE AND EXPAND THE DIVERSE TREE CANOPY COVER.

### EXPECTED CHANGE IN CHICAGO'S SUMMER CLIMATE WILL STRESS TREES.

The projected frequent, prolonged, intense droughts and higher temperatures may disturb some trees since the soil moisture will be low. Trees will be stressed, making them more susceptible to plant pathogens. Loss of trees reduces the amount of carbon sequestration, impacting air quality.

# WASTE: "CAN GRASS CLIPPINGS AND DEAD LEAVES HELP PLANTS GROW?"

## URBAN TREES NEED NUTRIENTS.

Landscape debris, fallen leaves and other yard waste are treated as garbage. The material is sent to a landfill, which increases use of fossil fuels, or the material is burned in an incinerator, which may impact air quality.

## DUE TO EXPECTED CHANGES IN CLIMATE, URBAN TREES WILL NEED MORE NUTRIENTS.

With climate change the summers will be hotter with periods of drought. Trees in Chicago have not adapted to that type of climate. The nutrients from composted landscape debris can help to sustain the trees.

*Mulch made from chipped-up fallen trees is placed around Chicago Park District trees to help retain moisture for the trees and suppress weeds.*

**GREEN SOLUTION:**
DESIGN AND MANAGE PROJECTS TO SEND LESS TO LANDFILLS OR INCINERATORS.

# CAPITAL DEVELOPMENT AND UTILITIES:
## "WHO MADE THAT MESS IN THE STREET?"

### UTILITY WORK DAMAGES STREETS, SIDEWALKS AND TREES.

When utility companies rip up sidewalks and grass parkways, they make random patches with concrete or asphalt and severely damage tree roots. Sometimes one utility company will do underground work and patch the sidewalk. A few weeks or months later, another utility company may dig up the parkway or break the sidewalk and patch it again. Those excavations and patches shorten the lives of trees at that segment of sidewalk.

### REPEATED EXCAVATIONS AND PATCHING BENEFIT NO ONE.

In addition to the cost of re-doing the work, patching wastes natural resources, may create dust that increases air pollution, and may result in the loss of trees. The patches are sometimes uneven, making it less comfortable for people walking or biking so they may use their cars instead, which increases the use of fossil fuels and impacts air quality.

## GREEN SOLUTION:
DESIGN TO MINIMIZE IMPACT OF INFRASTRUCTURE DURING REHABILITATION OF UTILITIES.

# QUALITY OF LIFE

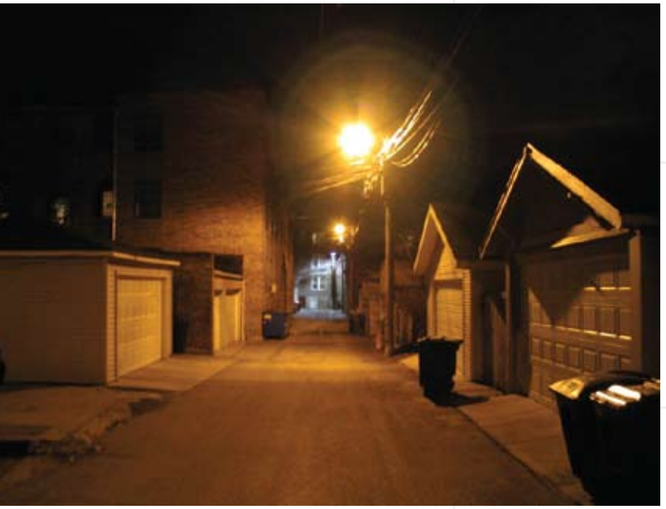
## OBJECTIVE:

IMPROVE SAFETY AND PUBLIC HEALTH AND ENGAGE PEOPLE IN THE OUTDOOR ENVIRONMENT.

# OPEN SPACE: "HOW CAN MORE PEOPLE BENEFIT FROM PARKS?

## IMPROVED ACCESS TO PARKS AND OPEN SPACE IS NECESSARY FOR PUBLIC HEALTH.

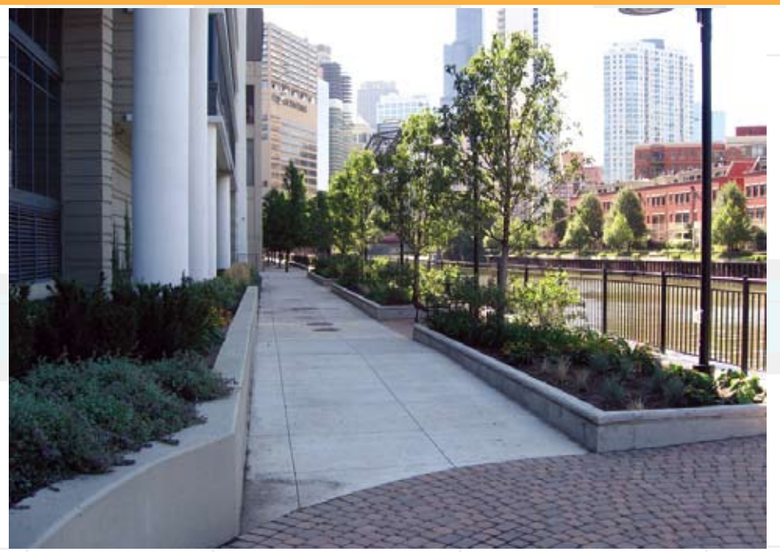
In areas with minimal or no open space, children and adults have fewer opportunities for relaxation and there are fewer opportunities for restorative experiences that can ease mental fatigue and stress. Minimal or no contact with nature can slow children's emotional, cognitive and values-related development. In addition, without the benefits of outdoor-based programs, young people are less capable of coping with new challenges and have lower self-esteem. [xix] In areas with few or no trees, hospital stays are longer and the need for medication is greater. Exposure to skin-damaging solar radiation is higher. People are less likely to ride bicycles or ride them less often in neighborhoods with unsafe bike paths or no bike lanes. [xx]



*In this Chicago Green Alley Project high pressure sodium lamps were replaced with white halide lamps that are more energy efficient and don't brighten the night sky.*

Before

After



*The Habitat Company has constructed a new high rise rental apartment building located on the Chicago River in the River North area with a publicly accessible and extensively landscaped riverwalk. The riverwalk provided a link that now completes the river trail from Kinzie Street to Grand Avenue, using the existing river trail at the East Bank Club.*

## ONGOING CLIMATE CHANGE WILL INCREASE THE PUBLIC'S NEED FOR CONVENIENT ACCESS TO PARKS AND OPEN SPACES.

With hotter temperatures, people will need to find relief from city heat.

**GREEN SOLUTION:**
DESIGN TO PROVIDE SAFE ACCESS TO THE CITY'S OUTDOOR ENVIRONMENT THROUGH PUBLIC OPEN SPACES AND PEDESTRIAN AND BIKE FRIENDLY RIGHTS-OF-WAY.

# GOOD LIGHTING: "WHY ARE THE STREETLIGHTS SO BRIGHT?"

## CHICAGO USES ENERGY FOR OUTSIDE LIGHTING THAT IS BRIGHTER THAN NEEDED.

Chicago has more outside lighting than most other cities. [xxi] Light pollution is light that shines where it is neither needed nor wanted. In addition to the financial cost of light pollution, it uses energy, which increases greenhouse gases. The International Dark-Sky Association calculates that unnecessary lighting wastes 12 million tons of coal, or 45 million barrels of oil, or $2 billion per year. [xxii]

Glare is light striking the eye directly from the source. It temporarily impairs vision. Glare compromises traffic safety. A passing car with high beams will cause momentary blindness. Glare challenges crime control and can hinder security by creating extreme shadows, offering refuge to criminals despite the bright lights.

## EXPECTED CLIMATE CHANGE WILL INCREASE THE OVERALL DEMAND FOR ENERGY, ESPECIALLY FOR COOLING.

Energy used for lighting adds to the energy burden. Eliminating unnecessary outdoor lighting reduces the demand for energy.

**GREEN SOLUTION:**
DESIGN TO MINIMIZE LIGHT POLLUTION, LIGHT TRESPASS AND GLARE.

# EDUCATION AND INVOLVEMENT: "WHAT IS MISSING?"

**THE PUBLIC NEEDS INFORMATION ABOUT THE BENEFITS OF ECO-FRIENDLY COMMUNITIES.**

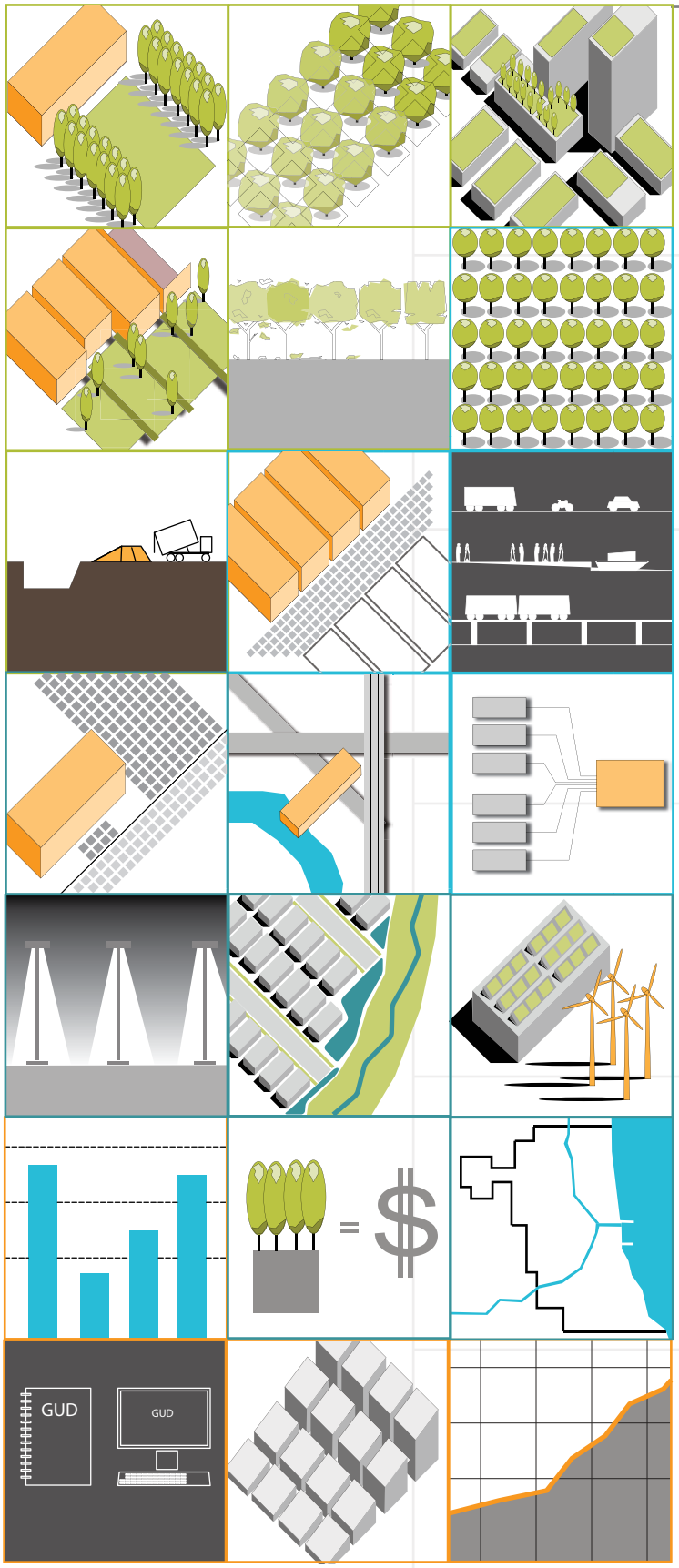
Without trails, waterways and other natural sites, there is less outdoor recreation and nature-based education. Without opportunities to learn about the natural environment or participate in the related activities, children and adults miss those enriching experiences.

**EXPECTED CLIMATE CHANGE WILL INCREASE THE NEED TO EDUCATE CHILDREN AND ADULTS ABOUT CREATING ECO-FRIENDLY COMMUNITIES.**

This generation and future generations will be responsible for sustaining the environment.

**GREEN SOLUTION:**
DESIGN TO ENCOURAGE A CULTURE OF UNDERSTANDING AND RESPECT FOR HOW THE LANDSCAPE FUNCTIONS.

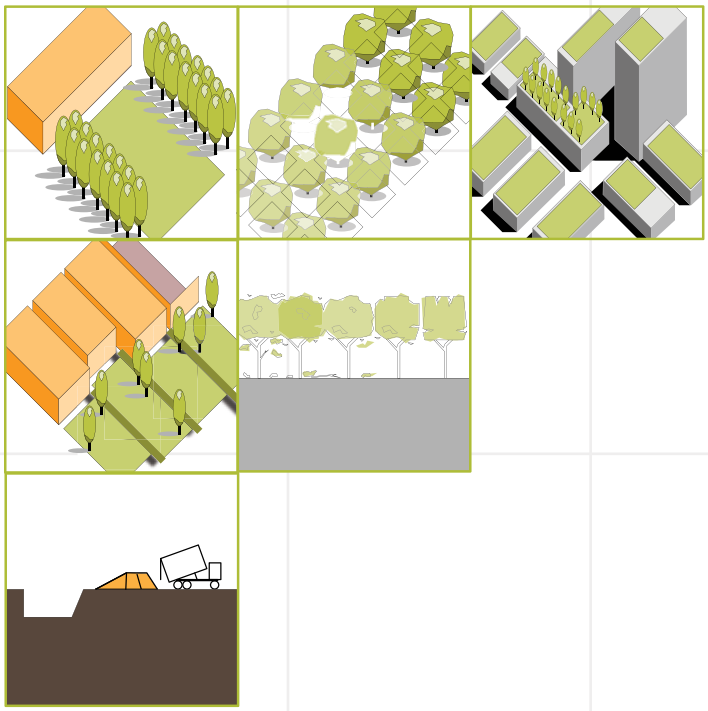
*The Lurie Garden in Millennium Park designed by Kathryn Gustafson includes signage that explains the benefits of using native and indigenous plants in landscapes.*




## APPROACH AND ACTION

In Chapter 2, the Green Solutions present broad direction for what needs to be done to maintain and improve Chicago's urban design for environmental sustainability. Chapter 3 focuses on the specific actions Chicago planners, builders and government agencies must take to make Green Urban Design a reality. Some developers will need to change the way they think about Chicago's built environment. Others will be able to promote changes long envisioned. Local government will need to operate differently. Twenty-one Key Actions are presented in the context of four major approaches: Environment, Integration, Innovation and Assessment.

*Icons designed by Peter Kindel of Topografis*



# ENVIRONMENT

## DESIGN AND MAINTAIN TO ENSURE ENVIRONMENTAL SUSTAINABILITY AND FUNCTION.

The City Beautiful Movement of the late 1890s and early 20th century gave Chicago Jackson Park, the Museum of Science and Industry and Wacker Drive. One hundred years later, the understanding and use of environmental resources has changed. Buildings, parks and roads now need to be not only beautiful but also ecologically functional. Urban design can help foster the management and maintenance of natural resources through six Key Actions.

## (1) ADOPT SUSTAINABLE LANDSCAPE STANDARDS FOR ALL PUBLIC LANDSCAPES.

Publicly owned and managed landscapes such as neighborhood parks, forest preserves, campus parks, plazas or landscaped grounds around public buildings represent a significant amount of of Chicago's land surface area.

Each public landscape management agency should develop and adopt Sustainable Landscape Standards that integrate sustainability into the design, construction and management of the landscapes under their jurisdiction, with deadlines for the initiation and elimination of certain practices identified as unsustainable.

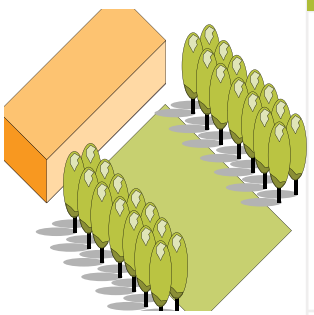
To facilitate this task, the Green Urban Design Public Landscapes Task Force has developed a Guidance Document presenting how the Green Urban Design principles presented in Chapter Two of this Plan should be applied to public landscapes. Although all the principles listed in the Guidance Document should be adhered to, the practice and materials to emphasize will vary depending on the way in which the landscapes are used by the public and the existing and anticipated management and maintenance resources.

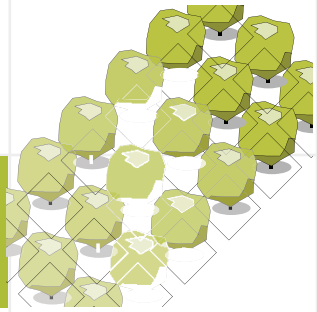
## (2) IMPROVE THE ENVIRONMENTAL PERFORMANCE OF THE LANDSCAPE REQUIREMENTS FOR DEVELOPMENT SITES.

Since 1991, the City of Chicago has required builders of new or substantially renovated commercial or large residential buildings to incorporate landscaping into their plans. Originally established to help beautify the City and support property values, the Chicago Landscape Ordinance was significantly amended in 1999 when requirements for internal landscape islands and trees were introduced to help reduce the impact of large parking lots on the Urban Heat Island Effect. The ordinance currently prescribes three categories of landscaping: planting trees on parkways; screening the perimeters of parking lots, loading docks and other vehicular use areas visible from the street; and landscaping within parking lots, loading docks and other vehicular use areas. The amount of landscaping depends on the site size and amount of street frontage.

As of mid-2007, an additional 110,000 trees have been planted due to the enforcement of the landscape requirements. That includes more than 46,000 new street trees, which represent over 8 percent of Chicago's estimated street tree population.

Taking a step further in maximizing the benefits landscaping provides to site owners requires revisiting current requirements to ensure they promote landscape treatments that follow the guiding principles presented in this Plan. New performance-based landscape improvements need to be clearly communicated in the requirements. To best accommodate the constraints, needs and opportunities resulting from different land uses and area-specific characteristics, these performance standards may need to vary from one place to another.



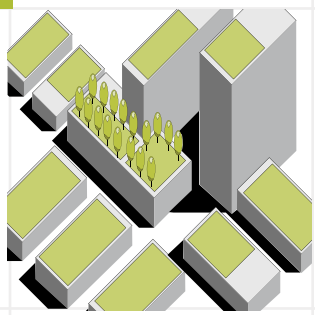


## (3) EXPAND THE ENVIRONMENTAL PERFORMANCES OF THE GREEN ROOF INITIATIVE.

With more than 250 green roofs amounting to over 13 acres built as of mid-2006 and with another 250 projects planned or under construction, Chicago is North America's leader for vegetated rooftops. This success is based on a combination of requirements and incentives that have efficiently promoted green roofs as standard construction practice.

To further maximize the benefits of its green roof initiative, the City of Chicago should incorporate the Sustainable Development Policy requirements into the Zoning Code, to increase the required green roof coverage and establish minimum green roof depths while offering alternative options when a green roof is not the most appropriate solution. Improving the associated maintenance requirements and overall enforcement and monitoring mechanisms will also be critical.

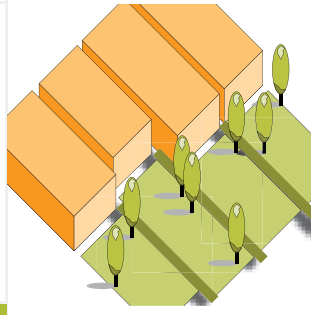
The American Society for Testing and Materials (ASTM), an international standard developing organization, is currently drafting a Guide (ASTM WK14283) that will define the fundamental aspects and performance considerations of a green roof system. Once the ASTM Guide for Green Roof Systems is published, the City of Chicago should tie the green roof requirements and incentives to the performance levels the guide defines.



## (4) PRESERVE CHICAGO'S GREEN BACKYARDS.

A large percentage of the City's tree population is located in residential yards. Failure to preserve this "soft" infrastructure would mean soaring air conditioning costs during the summer, worsened air quality with the associated respiratory diseases and need for considerable public sewer network upgrades to handle the stormwater runoff.

Instead, the City of Chicago can build upon existing legislation and initiatives such as the rear-yard open space requirement, construction permit processes and incentives such as the rain-barrel program, rain garden subsidies and initiatives linking permeability to sewer maintenance costs to ensure backyards remain permeable and Chicago residents can easily implement stormwater best management practices. To preserve Chicago's largest historic trees and help plant new ones, the City of Chicago should coordinate with community organizations, local sponsors and not-for-profit organizations to foster tree planting initiatives already in place and develop a tree protection ordinance based on commonly defined criteria.



## (5) STRENGTHEN AND ENFORCE CHICAGO'S GREEN INFRASTRUCTURE MAINTENANCE REQUIREMENTS.

To develop a healthy canopy shading their surroundings, trees, especially when young, need to be trimmed. Regular maintenance is critical to sustain the environmental benefits provided by good design (Action 2) and adequate growing media (Action 6).

The City of Chicago needs enforceable mechanisms that assign responsibility for the maintenance of landscape and stormwater management best management practices. In some instances, those mechanisms are in place but not implemented. It will be important to clearly communicate maintenance requirements to permit applicants and to require both legally binding maintenance agreements and record keeping on critical design components. Penalties for failure to comply will need to be designed to act as an efficient deterrent. The City will also need to establish procedures such as the prioritization of best management practices, and the factors to determine inspection frequency as well as allocation of resources for site inspection.

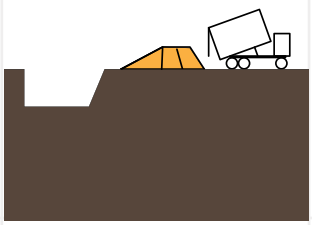
For example, tree trimming is a specialized type of maintenance. Trimming can be done reactively in response to citizen requests to eliminate hazards such as clearing obstructed signs or removing branches at risk of falling or trimming can be done proactively through preventative pruning for tree health and safety. Proactive trimming for health and safety is generally considered the industry standard for efficient maintenance of city trees. Proactive trimming is typically performed on a systematic block by block basis while reactive trimming will send crews from address to address, wasting fuel and time. As a result, trees require more time to trim since there is a longer cycle (10 years versus five years) and thus more growth. The City of Chicago should implement a cyclic tree trimming program coupled with a risk-based approach to citizen requests for trimming.

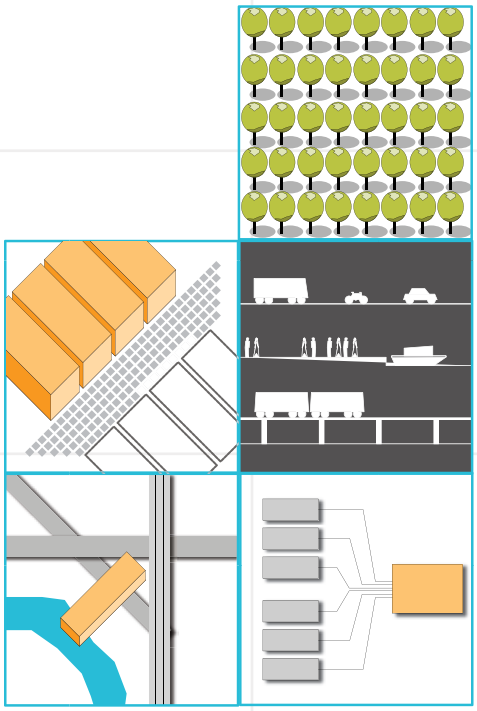
## (6) EXPAND SOIL STANDARDS AND CREATE SOIL ENHANCEMENT FACILITIES DIVERTING CHICAGO'S VEGETATIVE WASTE FROM THE LANDFILL.

Although soils play an essential role in maintaining the quality of the land, air and water resources Chicagoans rely on, they are rarely addressed in the statutory and non-statutory documents that regulate and guide Chicago's urban development.

The City of Chicago should strengthen and improve the soil standards associated with the required landscape improvements for public or private site developments, including soils volume, soils composition, soils testing and conditions for use of engineered growing medium (structural soil), street planters and tree vaults.

To facilitate the use of amendments that will help reach higher soil quality standards, the City of Chicago should create a decentralized network of "Soil Enhancement Facilities" that recycle vegetative waste. These facilities could compost vegetation produced by public landscapes, such as from street trees, public parks and landscaped medians and from private sites as well as food waste produced by restaurants. Such initiatives would significantly reduce the volume of waste sent to landfills. It would also reduce public landscape management agencies' operational costs associated with transportation and disposition of debris or purchasing of soil amendments. Composting of landscape waste is a requirement of the State of Illinois.





# INTEGRATION

## PROMOTE DESIGN THAT IS RESPONSIVE TO THE NEIGHBORHOOD CONTEXT BALANCING FUNCTIONS, ENVIRONMENTAL GOALS AND ECONOMIC VITALITY.

The City can encourage builders to consider environmental sustainability by its own example. Governmental regulations and programs can foster an atmosphere of cooperation that benefits the environment and the citizens of the City. Five Key Actions promote Green Urban Design.

## (7) DEVELOP AND IMPLEMENT A GROWTH AND MANAGEMENT PLAN FOR ALL COMPONENTS OF CHICAGO'S URBAN FOREST.

Chicago's estimated 4.1 million trees grow in forest preserves, other public parks and open space; along streets; in private residential yards; or in parking lots associated with commercial or manufacturing land uses. Planting conditions are just as diverse: open landscapes, raised planters, tree pits with iron grates and parking islands

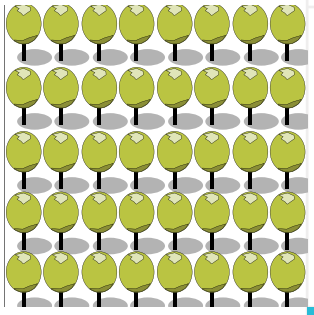
The preservation and expansion of Chicago's urban forest in the near future and the more distant future will require the development of strategies adapted to the diversity of planting conditions. The development of a Growth and Management Plan would provide a road map for all and generate the momentum needed to increase Chicago's tree canopy cover.

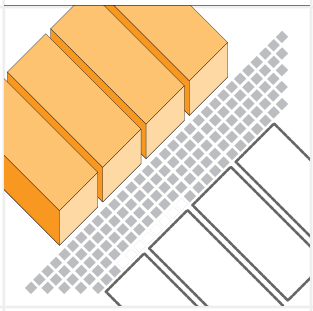
## (8) ADOPT CONTEXT-DRIVEN STREET AND ALLEY DESIGN STANDARDS.

Over the past several years, the Chicago Department of Transportation has developed and tested a palette of "Green Alley" designs tailored to the various layout, grading and soil constraints found in Chicago neighborhoods. Not only do green alleys enable safe and convenient trash pick up and garage access, they also address local basement flooding, light trespass, and Urban Heat Island issues.

Since 1998, the Chicago Department of Transportation has adopted flexibility in residential roadway design to minimize impacts on trees as well as other infrastructure elements. Plans are submitted to other agencies such as the Bureau of Forestry to assess impacts and decisions on roadway width. These decisions should be made taking both transportation needs and site needs into account.

While green alleys should be adopted as the new standard for alley improvements, a comparable matrix of street designs tailored to the needs of all right-of-way users across Chicago's residential, commercial and manufacturing areas should be developed and implemented.



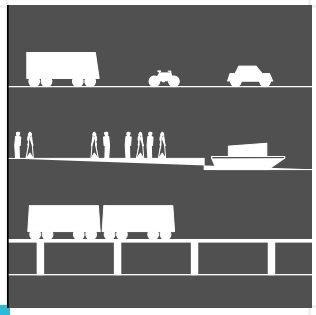


## (9) DEVELOP AND IMPLEMENT BOTH CITYWIDE AND NEIGHBORHOOD TRANSPORTATION IMPROVEMENT PLANS AND PROGRAMS.

In 2006, the City of Chicago adopted the "complete streets" policy, which mandates that "the safety and convenience of all users of the transportation system, including pedestrians, bicyclists, transit users, freight and motor vehicle drivers shall be accommodated and balanced in all types of transportation and development projects and through all phases of a project." While recognizing the role of the automobile, this policy statement expands the field of transportation infrastructure planning to fully integrate non-automotive modes such as public transit, cycling and walking.

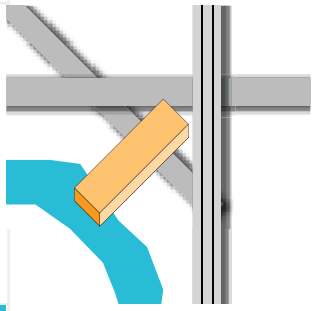
Several citywide planning efforts and programs are already under way to help achieve this goal, including the Pedestrian Safety Program and the Bike 2015 Plan. Other citywide planning efforts to consider include a systematic review of potential improvements to the public right-of-way design or management to increase transit efficiency (bus stop locations, traffic signal timing, dedicated bus lanes, etc.).

To help tailor the implementation of the citywide programs to the local level, the City is working with community residents on pedestrian planning through the Mayor's Pedestrian Advisory Council (MPAC). MPAC focuses on a wide range of pedestrian issues: safety, public awareness, enforcement, infrastructure, investments, etc. This work should be used as a model for other neighborhood-based transportation improvement planning initiatives.



## (10) ADOPT MULTI-MODAL SITE ACCESS REQUIREMENTS.

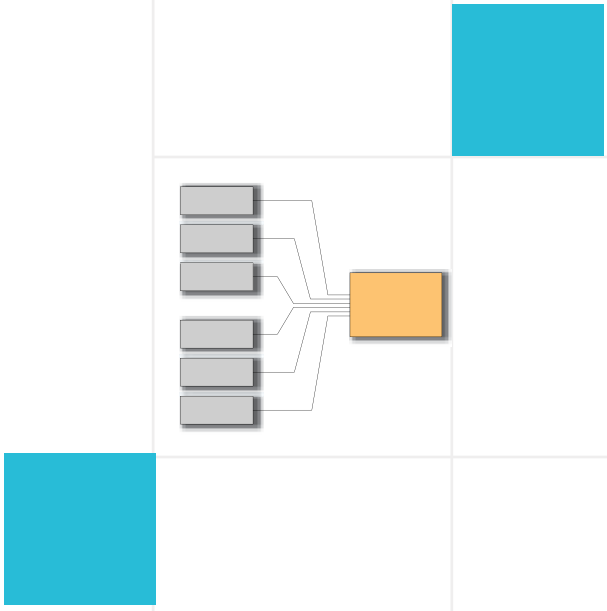
Site access is primarily considered in terms of vehicular access and vehicular traffic safety. While some amendments to Chicago's Zoning Code promote pedestrian safety and access in strip malls and offer bicycle parking in large residential developments, important gaps remain and need to be addressed. At the same time, project reviewers will need thorough training in the Chicago Complete Streets Policy and its implications for project evaluation.

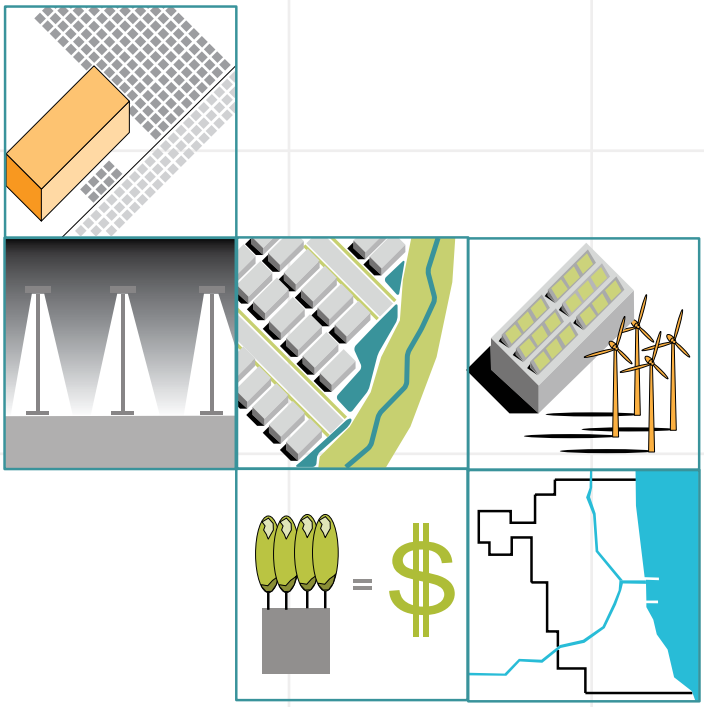


## (11) CONSOLIDATE ALL SITE DESIGN GUIDELINES INTO AN INTEGRATED PLAN REVIEW PROCESS.

A major complaint in the development community is that the rules are not clear from the beginning. Being sent from one department, or discipline within a department, to another and getting conflicting direction confuses applicants, slows projects and inhibits innovative solutions. Comprehensive site design guidelines that present all landscaping, stormwater management and access requirements impacting site design will improve project design.

Successfully incorporating sustainability in Chicago's urban development will rely on the City's ability to administer the site plan review and site inspection processes in an integrated manner. Cross-training staff and investing in electronic submission and data-sharing tools will help facilitate interdepartmental communication to fast-track applications.





# INNOVATION

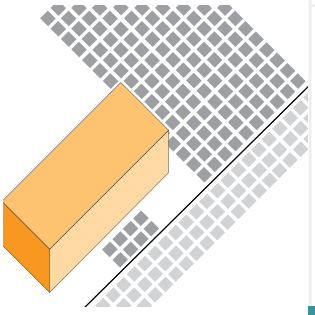
## TEST, EVALUATE AND, WHEN APPROPRIATE, EXPAND USE OF AND MONITOR GREEN TECHNOLOGIES.

Chicago is a world leader in the promotion and construction of green roofs. Currently almost 7 million square feet of green roofs are in various stages of development on both public and private projects. Chicago is also the leading city in the United States for the number of Leadership in Energy and Environmental Design (LEED) buildings. In addition, the City has developed innovative permeable paving techniques to be used in alleys. Five "Green Alley Prototypes" have been built and monitored in several locations and are now ready to be implemented at a larger scale, while providing an example to private developments on how to successfully build permeable paved surfaces that will function with Chicago's soil and climate.

Building upon these successes, Chicago intends to continue to lead by example in testing, evaluating and, when appropriate, expanding the use of innovative urban design techniques and supporting their adoption by the private sector. The City plans to continue the use of innovative techniques by pursuing six Key Actions.

## (12) DEVELOP AND ADOPT 'GREEN' PAVING TECHNIQUES AND STANDARDS.

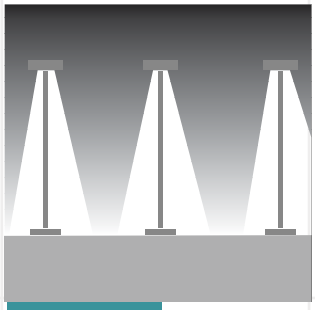
One of the primary sources of the environmental disruptions generated by urban developments is the amount of pavement. The Chicago municipal code's current provisions related to paving are intended to address proper installation for maximum resistance and dust prevention. Paving techniques have significantly evolved; it is now possible to recycle paving materials, or to incorporate recycled materials into asphalt or concrete mixes. Additionally, a wide range of permeable and high-reflectance materials have become available at an affordable price. These green paving techniques have been successfully used and tested by the Chicago Department of Transportation throughout the city and should be adopted now.



## (13) DEVELOP AND ADOPT OUTDOOR LIGHTING EFFICIENCY AND DESIGN STANDARDS.

In 1999, in an effort to reduce the deadly impact of night light pollution over the migrating bird population, the City of Chicago cooperated with the National Audubon Society to initiate the "Lights Out" program – the first of its kind in the United States. For five months during the year, owners of tall building are asked to dim their decorative lighting after 11 p.m. to provide safety for migrating birds, in addition to pulling blinds or turning off interior lights in their lobbies. While this program has helped sensibly reduce bird collision, it does not address two other fundamental issues associated with light pollution: energy consumption and glare.

The City of Chicago should research high-efficiency lighting technology such as LED for street lighting. Investigations should also be conducted on glare and spillover reduction through improved light fixture design. Lighting efficiency and design standards should balance safety, comfort and environmental responsibility.



## (14) EXPAND THE USE OF PUBLIC GREEN INFRASTRUCTURE TO MANAGE STORMWATER.

The Chicago Department of Water Management is developing a model to identify bottlenecks in Chicago's combined sewer system. The analyses resulting from this modeling effort will identify areas where action needs to be taken.

In some instances, replacement of existing sewer pipes with larger ones might be appropriate. In many cases, using Chicago's public green infrastructure to relieve the sewer network from excessive amounts of stormwater will be the most affordable and long-lasting solution.

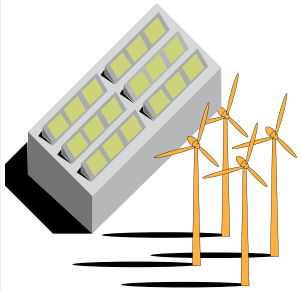
There are many opportunities to reduce the impact of stormwater runoff on Chicago's combined sewer system and rivers. Prototypes should be developed and monitored such as landscaped parkway bump-outs used for traffic-calming and stormwater infiltration along residential streets, sustainable streetscapes featuring stormwater parkway planters, permeable sidewalks or parking lanes and conservation of W.P.A. streets.

In collaboration with the Metropolitan Water Reclamation District, the City of Chicago should develop a system of landscapes that are designed, managed and monitored as part as the City's stormwater management infrastructure.

## (15) EXPLORE THE USE OF ALTERNATIVE ENERGY SOURCES IN STREETSCAPES AND PUBLIC LANDSCAPES.

The City of Chicago should explore means to capture and use solar, wind, biomass or geothermal energy in Chicago public rights-of-way and public landscapes. Potential applications could include solar-powered roadway signage or pedestrian accent lighting.

The feasibility of granting public right-of-way easements to facilitate use of geothermal technology by adjacent developments should also be assessed.



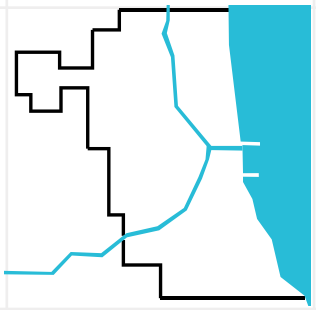
## (16) EXPAND GREEN INNOVATION INCENTIVES.

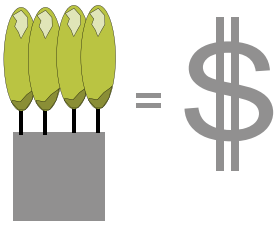
Creating rewards for those who go beyond city requirements and market expectations to deliver high quality Green Urban Design will not only help achieve the objectives and guiding principles presented in this Plan but will also generate new economic opportunities. Supporting innovation is a strategic investment.

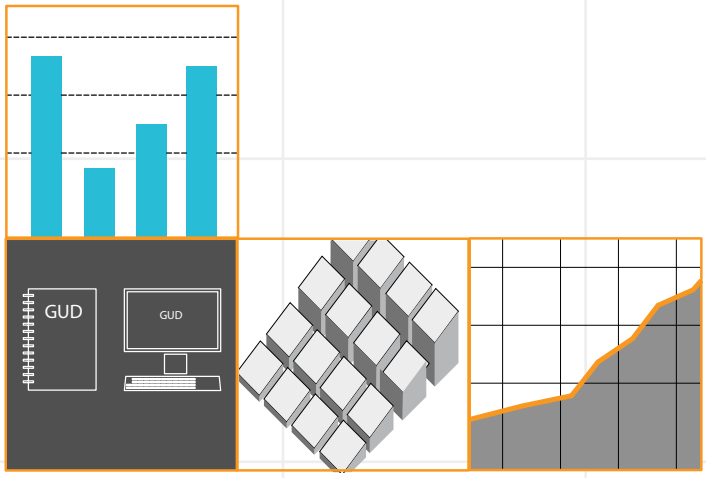
The City of Chicago should create a streamlined Tax Increment Financing program for innovative green improvements. Other potential incentives may include: granting property tax credits or exemption of renewed tax assessment for the residential sector and providing free advertising to "Green Permit" applicants.

## (17) INCORPORATE ENVIRONMENTAL PROFILE MAPS AND DATA ANALYSES INTO ALL PLANNING PROCESSES AND POLICIES.

Major planning efforts that will affect Chicago's urban design should systematically incorporate an environmental context analysis using the land, air and water indicator data to supply decision making.








# ASSESSMENT

## EMPOWER ALL STAKEHOLDERS AT ALL TIMES WITH AN UNDERSTANDING OF THE RATIONALE AND OUTCOMES

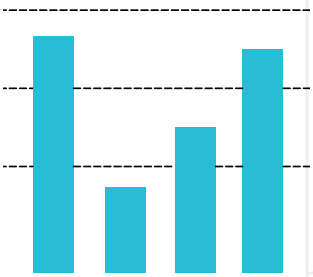
There are two challenges to long-term planning in government. The term of elected leaders is often shorter than the implementation time-period some projects require. Residents rarely get involved while intermediary progress is occurring and tend to show little support for such "big schemes." One way to overcome these difficulties is to set high standards and means for accountability, allowing community leaders and residents to keep score and remain engaged. Four Key Actions will help establish a solid base for accountability:

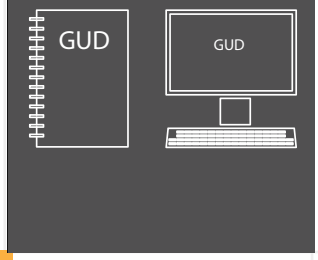
## (18) INSTITUTIONALIZE THE LAND, AIR AND WATER INDICATORS.

Indicators help quantify, simplify and communicate complicated phenomena in an easy-to-understand format. Indicators are needed to assess the status and the effectiveness of implemented responses. The land, air and water indicators will help assess Chicago's urban design impact on the objectives of this Plan. The indicators should be integrated into the City of Chicago's Environmental Indicators.

## (19) MONITOR AND PUBLICIZE THE IMPLEMENTATION OF GREEN URBAN DESIGN BEST MANAGEMENT PRACTICES.

Measuring achievements can be done in two complementary ways. The indicators presented in Action 18 will be important, since having a measurable impact on the local environmental resources will require some time. In the interim, monitoring project-based performance measures will show if the City is moving in the right direction and will demonstrate how Green Urban Design can be done in Chicago. Efficient monitoring will require the development of appropriate data management and data sharing tools. Publicizing this information and making it accessible to the public will also help accelerate the implementation by residents, business owners, designers and developers.





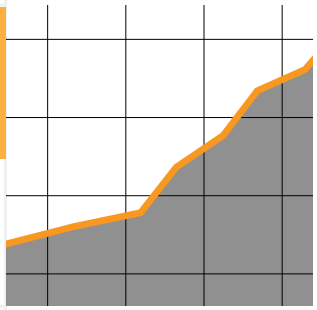
## (20) EXPAND THE CITY AND ASSOCIATED SISTER AGENCIES' WORKFORCE CAPACITY FOR ENVIRONMENTAL MANAGEMENT.

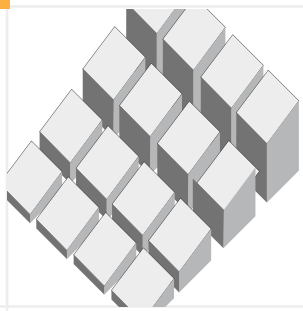
Development of "Green Initiatives" throughout the City services has largely relied on one "Green Projects Coordinator" within each Department. While maintaining this leadership role is important, it is equally critical to increase the entire City workforce's capacity for environmental management. This will require investing in training at the pre-employment and employment stages.

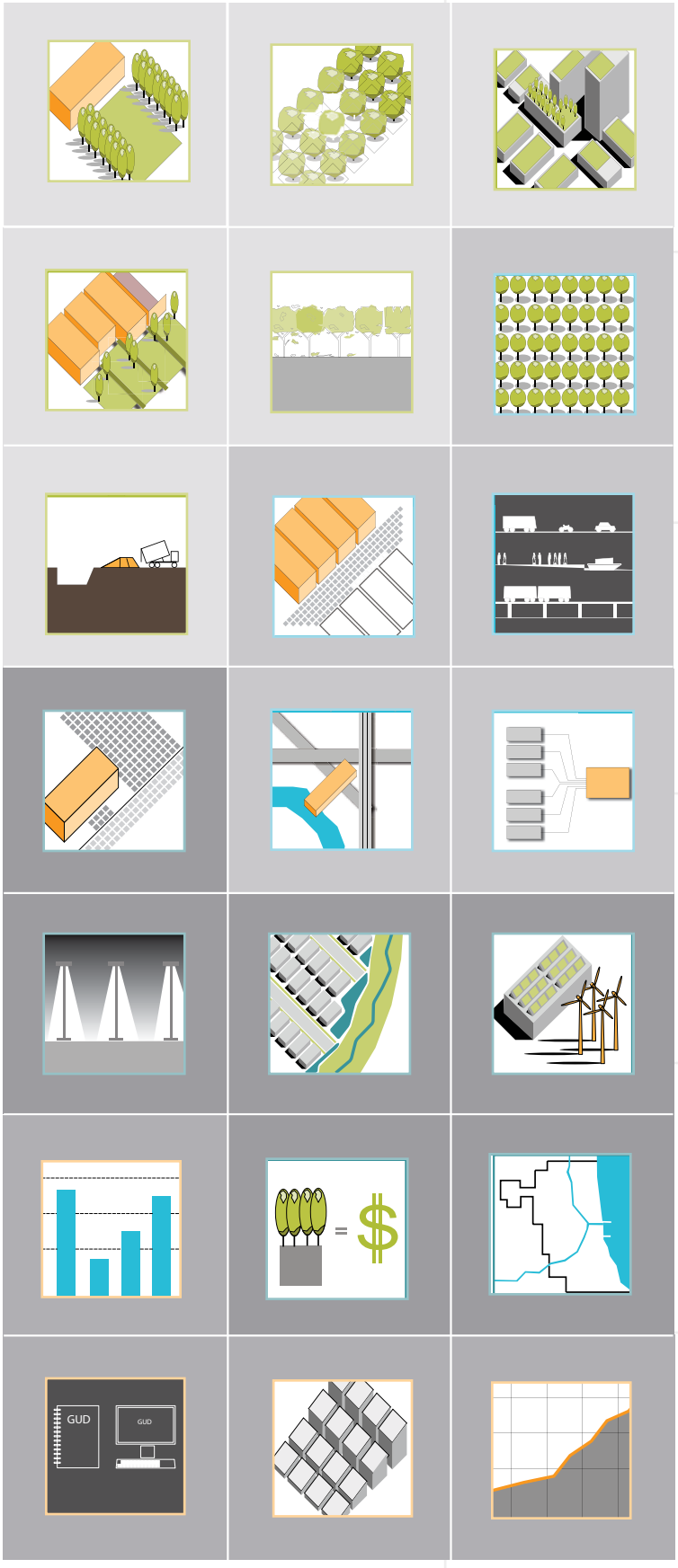
A special emphasis should be placed on managers, who should connect the green project coordinator with their team. Training should provide staff with an understanding of the City's environmental goals, objectives and associated strategies, information about industry innovations and trends as well as research findings.

## (21) UPDATE AND ANNUALLY REPORT ON THE GREEN URBAN DESIGN IMPLEMENTATION ROAD MAP

The Green Urban Design Implementation Road Map identifies more than 100 specific steps for implementing the 21 Key Actions. The realization of these steps involves a variety of stakeholders and multiple timeframes. A high level of commitment and coordination will be needed to progress towards the completion of all 21 key actions. To expedite and monitor the implementation of the Plan, an annual report will be presented to Chicago's City Council identifying progress, providing updates and describing changes to the Implementation Road Map.





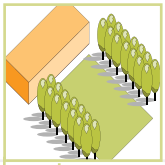



# APPENDIX 1: IMPLEMENTATION ROAD MAP

The Implementation Road Map presents critical steps for each of the 21 key actions that will enable their successful realization. It also details target dates and responsibilities. While presented in the form of an appendix, the Implementation Road Map is intended as a dynamic document to be used as a public progress report every year. As a result, its content will evolve to reflect completed steps, but also added or modified steps when appropriate to support the realization of the 21 key actions.

Below is a list of the public stakeholders identified throughout the Implementation Road Map and their abbreviations.

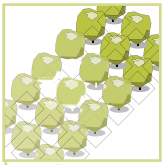
BOF: Bureau of Forestry
CDOT: Chicago Department of Transportation
CPD: Chicago Park District
CPS: Chicago Public Schools
DGS: Department of General Services
DOB: Department of Buildings
DOE: Department of Environment
DOIT: Department of Information Technology
DOZ: Department of Zoning
DZP: Department of Zoning and Planning
DSS: Department of Streets and Sanitation
MO: Mayor's Office
MWRD: Metropolitan Water Reclamation District
PBC: Public Buildings Commission



## ACTION (1) – ADOPT SUSTAINABLE LANDSCAPE STANDARDS FOR ALL PUBLIC LANDSCAPES.

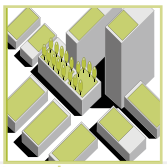
| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PILOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 1.1 | Develop Sustainable Landscape Standards to provide a clear means of achieving prescribed design and management goals for parks. | CPD | **01/2008** | 01/2008 |
| 1.2 | Develop Sustainable Landscape Standards to provide a clear means of achieving prescribed design and management goals for boulevards, malls and plazas. | CDOT | 08/2009 | 12/2008 |
| 1.3 | Develop Sustainable Landscape Standards to provide a clear means of achieving prescribed design and management goals for landscapes surrounding the City's public buildings. | DGS | 01/2009 | 07/2009 |
| 1.4 | Develop Sustainable Landscape Standards to provide a clear means of achieving prescribed design and management goals for landscapes surrounding the public schools. | CPS | 12/2008 | 05/2009 |
| 1.5 | Adopt Sustainable Landscape Standards for each agency constructing public landscapes such as campus parks, field houses and police stations. | PBC | | 07/2009 |
| 1.6 | Develop Sustainable Landscape Standards for privately developed public landscapes to provide a clear means of achieving prescribed design and management goals for public open spaces built as part of Planned Developments. | DZP | **01/2010** | 01/2011 |
| 1.7 | Coordinate public landscapes roundtables and communicate with local nurseries to improve the diversity of planting supplies and stock. | MO | 05/2009 | 05/2009 |

In green = Actual Date



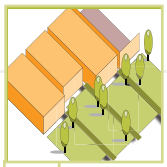
## ACTION (2) – IMPROVE THE ENVIRONMENTAL PERFORMANCES OF THE LANDSCAPE REQUIREMENTS FOR DEVELOPMENT SITES.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 2.1 | Assess the environmental performances of existing landscape requirements and guidelines (sample study). | DZP | 06/2009 | 12/2009 |
| 2.2 | Examine possible changes to improve the environmental performances of existing landscape requirements based on the 2.1 assessment, including:<br>- Establishment of a minimum project size that requires a landscape architect;<br>- Revision of trigger mechanisms for public projects and nonprofits;<br>- Revision of an existing prescriptive requirement to better reflect land use and urban heat island mitigation goals. Consider the creation of mitigation requirements based on parking excess, such as a threshold that is a specific level beyond the required parking ratio;<br>- Revision of the administrative adjustments section to clarify approved landscape treatments that improve cooling and stormwater management benefits of proposed alternatives;<br>- Addition of an alternative performance-based compliance path to be added to the menu of qualifying options for the landscape ordinance. | DOZ / BOF | 01/2011 | 12/2011 |
| 2.3 | Update parking garage landscape requirements and develop Special Use green design guidelines, | DZP | 06/2009 | 12/2009 |
| 2.4 | Improve, consolidate and better communicate a recommended plant list. The improved list should emphasize adapted, drought-tolerant large canopy trees and present the benefits of recommended plant materials. | MO | 05/2009 | 05/2009 |
| 2.5 | Educate staff (development projects managers and reviewers) on:<br>- Flexibility of current landscape improvements and parking layout requirements to incorporate stormwater Best Management Practices;<br>- Practical outcomes of 2.1 through 2.4. | MO | Tied to 2.1 and 2.4 | TBD |



## ACTION (3) – EXPAND THE ENVIRONMENTAL PERFORMANCES OF THE GREEN ROOF INITIATIVE.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PILOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 3.1 | Define minimum performance specifications for green roof systems ("DOE Guidelines" currently referred in the Chicago Municipal Code do not exist) using ASTM Guide or equivalent reference standard. | DZP | 06/2009 | 12/2009 |
| 3.2 | Tie existing green roof requirements and incentives to performance levels identified through 2.1. | DZP | 06/2009 | 12/2009 |
| 3.3 | Improve the Green Building / Building Green matrix to expand required roof coverage percentages and expand the menu of alternative best practice options. | DZP | 06/2007 | 12/2008 |
| 3.4 | Incorporate the improved Green Building / Building Green matrix in the "Green Design" paragraph of the Planned Development section of the Chicago Municipal Code. | DZP | 01/2009 | 06/2009 |
| 3.5 | Monitor enforcement of 2-year Green Roof Maintenance Contract requirement. | DZP | 07/2008 | 10/2008 |



## ACTION (4) – PRESERVE CHICAGO'S GREEN BACKYARDS.

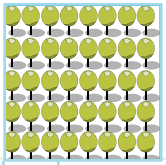
| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 4.1 | Modify existing code language to require rear yard open spaces to remain permeable. | DOZ | 01/2009 | 12/2009 |
| 4.2/ 7.6 | Coordinate with not-for-profit and community organizations as well as local sponsors and potential grant donors to conduct a residential tree planting campaign. | DOE / BOF | 06/2009 | 06/2010 |
| 4.3/ 7.8 | Coordinate with not-for-profit and community organizations to develop and adopt a heritage tree preservation ordinance. | DOE | 05/2009 | 07/2009 |
| 4.4 | Expand the Downspout Disconnect and Rain Barrel Program. | DOE / DWM | 01/2009 | **On-going** |

## ACTION (5) – STRENGTHEN AND ENFORCE CHICAGO'S GREEN INFRASTRUCTURE MAINTENANCE REQUIREMENTS.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 5.1 | Establish a mechanism to ensure that green infrastructure maintenance requirements (green roofs and other stormwater best management practices, in particular) are tied to the deed and passed to successive property owner. | DOZ | 06/2009 | TBD |
| 5.2 | Communicate long-term maintenance requirements with permit approval. | DOB | 12/2008 | 06/2009 |
| 5.3 | Provide education (Chicago Center for Green Technology) on sustainable maintenance practice and associated cost savings. | DOE | **On-going** | **On-going** |
| 5.4 | Update tree pruning and planting manual. | BOF | 01/2008 | 6/ 2008 |
| 5.5 | Implement a cyclic tree trimming program coupled with a risk based approach to citizen requests for trimming. | BOF | 10/2008 | 01/2009 |

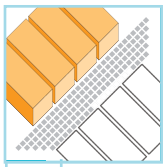
## ACTION (6) – EXPAND SOIL STANDARDS AND CREATE SOIL ENHANCEMENT FACILITIES DIVERTING CHICAGO'S VEGETATIVE WASTE FROM THE LANDFILL.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 6.1 | Update landscape ordinance and landscape guidelines to:<br><br>- Clarify and strengthen soil quality requirements;<br>- Add soil volume requirements, particularly for tree planting;<br>- Add definition of required soil testing;<br>- Tie structural soil requirement to test results. | BOF / DOZ | Tied to 8.2 | 12/2009 |
| 6.2 | Compile soil-testing results into a Geographic Information System (GIS)-friendly citywide soils database. | DOE / CDOT | 01/2007 | 07/2012 |
| 6.3 | Identify City-owned and vacant land to be used for creation of Soil Enhancement Facilities. | DZP | 12/2009 | TBD |
| 6.4 | Issue requests-for-proposals for sites identified in 6.3. | DZP / DOE | TBD | TBD |



## ACTION (7) – DEVELOP AND IMPLEMENT A GROWTH AND MANAGEMENT PLAN FOR ALL COMPONENTS OF CHICAGO'S URBAN FOREST.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 7.1 | Define canopy cover goals for residential, commercial, manufacturing land uses and associated rights-of-way, as well as for public landscapes. | DOE | 01/2009 | 06/2010 |
| 7.2 | Develop a City Tree Fund collecting revenue generated through 7.5, 7.6, 7.7 and 7.9. City Tree Fund to be used for 9.4, 9.5 and 9.11 | BOF / MO | 01/2009 | 01/2011 |
| 7.3 | Develop data acquisition, data-management and data-sharing tools to facilitate identification of tree deficiencies & management needs. | DOE | | 01/2010 |
| 7.4 | Develop a Residential Street Tree Management Plan to increase stocking levels. Prioritize street tree planting based on analysis of existing canopy cover ratio and age/specie profile as well as on urban heat island data. | BOF | 09/2008 | 10/2009 |
| 7.5 | Eliminate parkway tree exemption for residential developments less than four units. Require tree planting or paying a fee-in-lieu to be used by Bureau of Forestry to plant the parkway tree. | BOF | 12/2008 | 12/2009 |
| 7.6 / 4.2 | Coordinate with local neighborhood associations (nonprofit organizations and sponsors) for a tree planting campaign targeting under-canopied and high surface temperatures residential yards. | DOE / BOF | 06/2009 | 01/2010 |
| 7.7 | Coordinate with neighborhood associations to assist in monitoring trees for diseases, insects and damage. | DOE / BOF | 01/2007 | **On-going** |
| 7.8 / 4.3 | Coordinate with local neighborhood associations and not-for-profit organizations to develop a "heritage tree" ordinance. | DOE | 05/2009 | 07/2009 |
| 7.9 / 8.4 | Identify streetscape improvements and tree planting opportunities along commercial arterials. | CDOT | **On-going** | **On-going** |

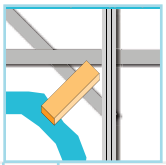


## ACTION (8) – ADOPT CONTEXT-DRIVEN STREET AND ALLEY DESIGN STANDARDS.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 8.1 | Adopt the Green Alley designs as the City's standards for all alley improvements. | CDOT | 12/2009 | 02/2010 |
| 8.2 | Develop a Sustainable Street Design Standard Matrix based on land-use, street types and right-of-way width. These standards should identify minimum sidewalk width and associated parkway landscape treatments. | CDOT / BOF | 12/2009 | 12/2009 |
| 8.3 | Modify the landscape ordinance to replace current parkway requirements with landscape provisions defined in the Sustainable Street Design Standard Matrix. | DOZ / BOF | 12/2008 | 12/2009 |
| 8.4/ 7.9 | Based on Sustainable Street Design Standard Matrix identify "out-of-balance" roadways – to be prioritized for improvements | CDOT | On-going | On-going |

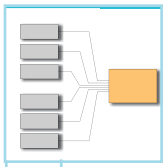
## ACTION (9) – DEVELOP AND IMPLEMENT CITYWIDE AND NEIGHBORHOOD MULTI-MODAL INFRASTRUCTURE IMPROVEMENT PLANS AND PROGRAMS.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 9.1 | Identify potential right-of-way improvements to support public transit efficiency (far side bus stops, priority systems for intersection signals, dedicated bus lanes, etc.) | CTA | 2008 | 2010 |
| 9.2 | Improve pedestrian amenities:<br>- Coordinate with the Senior Services Area Agency on Aging to improve bench program;<br>- Improve pedestrian crossing design;<br>- Expand countdown traffic lights. | CDOT | 08/2009 | 08/2010 |
| 9.3 | Based on the Complete Street Policy and the goals identified in the Bike 2015 Plan, the Pedestrian Safety Program, and 9.1 and 9.2 findings, develop and implement some Neighborhood Transportation Plans (priority neighborhoods to be determined – funding sources to be determined). | CDOT | TBD | TBD |



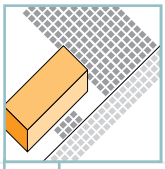
## ACTION (10) – ADOPT MULTI-MODAL SITE ACCESS REQUIREMENTS.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 10.1 | Improve the pedestrian and bicycle accessibility requirement for commercial and retail development providing a parking lot:<br>- Require a safe and clear pedestrian pathway from sidewalks to the building entrances;<br>- Require convenient bicycle parking close to the entrances. | CDOT / DOZ | **On-going** | **On-going** |
| 10.2 | Develop a Pedestrian and Bicycle Level of Service evaluation model. | CDOT | 08/2009 | 08/2010 |
| 10.3 | Require Planned Development to protect pedestrian and bicycle Level of Service (using model developed through 10.2) to guide design and determine potential financial contribution for transit improvements, sidewalk widening and inclusion of bike lanes. | DZP | Tied to 10.2 | Tied to 10.2 |
| 10.4 | Train all development project managers and reviewers on Chicago's Complete Streets policy. | CDOT | 02/2007 | 11/2007 |



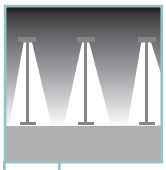
## ACTION (11) – CONSOLIDATE ALL SITE DESIGN GUIDELINES AND INTEGRATE PLAN REVIEW PROCESSES.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 11.1 | Improve upon the current IT system (Hansen) for construction permits electronic submission (including landscape drawings) to facilitate capture and sharing of all critical environmental performance data and project specifications throughout City departments. | DOB / DOIT | 01/2009 | 01/2010 |
| 11.2 | Develop an IT system to allow for electronic submission of planned development proposals, online tracking through all project phases of the Planned Development review, capture of all critical environmental performance data and project specifications, and data-sharing across City departments involved. | DZP | TBD | TBD |
| 11.3 | Revise the Planned Development Section of the Municipal Code to incorporate the Green Urban Guiding Principles into the paragraph presenting Standards and Guidelines. | DZP | 01/2011 | 12/2011 |
| 11.4 | Evaluate and monitor Planned Development compliance with "greening" requirements. | DZP | **On-going** | **On-going** |
| 11.5 | Conduct in-depth review of existing guidelines (Guide to the Landscape Ordinance, Street Design Guidelines and other guidelines impacting site design) to identify levels of enforcement, existing conflicts and possible obstacle to document consolidation. | MO | 11/2008 | 06/2009 |
| 11.6 | Record the decision-making process to prevent further contradictions. | DZP | 01/2010 | 01/2011 |
| 11.7 | Develop comprehensive site design guidelines including landscape, stormwater, access and parking layout requirements. The guidelines should incorporate a "Project Coordination and Permit Review Flowchart" to clearly identify required approvals and involved parties. | | | |
| 11.8 | Develop a "site design" web portal centralizing information on all relevant requirements and incentives. | MO | 06/2009 | **On-going** |
| 11.9 | Develop a team of cross-trained site inspectors. | MO | **On-going** | **On-going** |



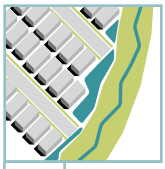
## ACTION (12) – DEVELOP AND ADOPT 'GREEN' PAVING TECHNIQUES AND STANDARDS.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 12.1 | Research paving regulations and standards regarding reflectance/emittance, permeability and recycled content. | CDOT / DOZ | On-going | On-going |
| 12.2 | Update City of Chicago Street Paving standards based on research findings. Updated standards should apply to all agencies or organizations, public or private, replacing or installing pavement in the public right-of-way. Specifications should include minimum recycled content and demolition waste diversion. | CDOT | On-going | 06/2012 |
| 12.3 | Update code language related to paving requirements:<br>- Remove current provisions that prohibit the use of permeable paving systems;<br>- Incorporate minimum reflectance and recycled content, as appropriate. | DOZ | TBD | TBD |



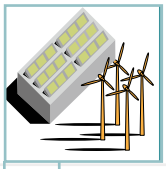
## ACTION (13) – ADOPT OUTDOOR LIGHTING EFFICIENCY AND DESIGN STANDARDS.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 13.1 | Conduct an audit and benchmarking study of city energy consumption for street lighting. | DOE | 01/2007 | 10/2008 |
| 13.2 | Research private outdoor lighting and light trespass regulations in the U.S. | DOB | 01/2009 | 06/2009 |
| 13.3 | Research high efficiency lighting technology (e.g. LED) and the feasibility of their use for Chicago street lighting. | DSS / DGS | 01/2008 | On-going |
| 13.4 | Using 13.2 findings, incorporate luminaries to the regulated structures and require – at a minimum – use of full cutoff luminaries for all exterior lighting (no horizontal light leaving the site). | DOB | 06/2009 | 12/2009 |
| 13.5 | Reduce street lighting levels to RP-8 standards. | CDOT / DSS | On-going | On-going |
| 13.6 | Conduct public awareness campaign regarding energy consumption (13.1) and safety and the efficiency of lower lighting levels. | DOE / CDOT | Pending resources | |



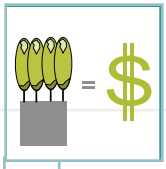
## ACTION (14) – EXPAND THE USE OF PUBLIC GREEN INFRASTRUCTURES TO MANAGE STORMWATER.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 14.1 | Research the feasibility of developing a Stormwater Plan for the City of Chicago. | DWM / MWRD | 01/2007 | 12/2009 |
| 14.2 | Identify Stormwater "hot spots" based on DWM sewer model analysis results. | DWM | 06/2007 | 7/2009 |
| 14.3 | Analyze cost/benefits of a stormwater fee and utility that would develop and manage landscapes and other non-sewer-related landscapes. | DWM | 12/2008 | 06/2009 |
| 14.4 | Assess public land opportunities for the creation of stormwater management public landscapes, including City-owned and vacant lots, residual spaces along City streets (e.g.: triangles). Consider if and how the historic boulevards could incorporate a stormwater function and yet retain the historic design intent. | DZP | 03/2009 | 06/2009 |
| 14.5 | Based on 14.2 develop and implement landscape parkway "bump-outs" achieving both traffic calming and stormwater management. | CDOT | 12/2009 | 01/2011 |
| 14.6 | Based on 14.4 develop and implement a palette of sustainable streetscape design elements, including permeable sidewalks, permeable parking lane, stormwater parkway planters, etc. | CDOT | **On-going** | **On-going** |
| 14.7 | Identify all W.P.A. streets to preserve and improve their sustainable urban drainage system. | CDOT | 07/2008 | 07/2010 |
| 14.8 | Determine the criteria pollutants that should be cleaned from right-of-way runoff discharged in Chicago's water bodies. | DOE | 06/2006 | **On-going** |
| 14.9 | Based on 14.8 findings, improve de-icing practices used in Chicago's public right-of-way (including salt storage conditions). | DSS | 12/2006 | **On-going** |
| 14.10 | Based on 14.2, 14.8 findings and techniques developed through 14.5 and 14.6, treat and direct stormwater runoff generated by the public-right-of-way to the rivers. | DWM | 06/2006 | **On-going** |



## ACTION (15) – EXPLORE THE USE OF ALTERNATIVE ENERGY SOURCES FOR PUBLIC STREETSCAPES AND LANDSCAPES.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 15.1 | Research opportunities to capture and use renewable energy in public landscapes and identify potential sponsors. | CPD | 06/2008 | 12/2008 |
| 15.2 | Expand use of photovoltaic cells to power temporary and permanent signals in the public-right-of-way. | CDOT | On-going | On-going |
| 15.3 | Research feasibility of granting right-of-way easements for geothermal. | CDOT | 12/2009 | 12/2010 |

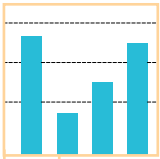


## ACTION (16) – EXPAND GREEN INNOVATION INCENTIVES.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 16.1 | Create a streamlined TIF for green improvements exceeding market expectations and City requirements. | DZP | 01/2009 | 12/2009 |
| 16.2 | Research the feasibility of granting tax credits or provide exemptions of renewed tax assessments for residential renovations incorporating green best practices. | DZP | 12/2008 | TBD |
| 16.3 | Identify potential locations to provide free advertising space for green permits applicants. | MO | TBD | TBD |

## ACTION (17) – INCORPORATE ENVIRONMENTAL PROFILE MAPS AND DATA INTO ALL PLANNING PROCESSES AND POLICIES.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PILOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 17.1 | Create Environmental Profile maps and data-sets on each of Chicago's 77 community areas using the water, air and land indicators. | DZP | 08/2007 | 12/2009 |
| 17.2 | Incorporate in all future Neighborhood Plans environmental data into the analysis supporting the plan recommendations. | DZP | 08/2007 | **On-going** |



## ACTION (18) – INSTITUTIONALIZE THE LAND, AIR AND WATER INDICATORS.

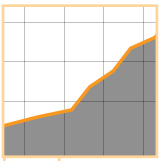
| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PILOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 18.1 | Incorporate into the City of Chicago Environmental Scorecards the Green Urban Design Indicators. | MO | | 12/2009 |
| 18.2 | Coordinate with the City's IT board to conduct a detailed business process analysis of the needs associated with data-collection and data-sharing for the Green Urban Design Indicators. | DOIT | 06/2009 | 09/2009 |
| 18.3 | Establish baselines and monitor evolution of the following water indicators:<br><br>- Effective Impervious Cover (EIC);<br>- Lake water pumpage volume per capita;<br>- Linear feet of improved waterfront. | DOE | 03/2008 | **On-going** |
| 18.4 | Establish baselines and monitor evolution of the following air indicators:<br><br>- PM 2.5 levels in the summer months;<br>- Ozone levels;<br>- Surface temperatures. | DOE | 03/2008 | **On-going** |
| 18.5 | Establish baselines and monitor evolution of the following land indicator:<br><br>Canopy cover ratio citywide and by land use. | DOE | 03/2008 | **On-going** |

## ACTION (19) – MONITOR AND PUBLICIZE THE IMPLEMENTATION OF GREEN URBAN DESIGN BEST MANAGEMENT PRACTICES.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 19.1 | Share monitoring protocol with public agencies implementing Best Management Practices and partner with them on various projects to ensure that projects collect relevant (scientific) performance data. | DOE | On-going | On-going |
| 19.2 | Develop and maintain a database of Green Projects/Best Management Practice built in Chicago. | DZP | 06/2009 | On-going |
| 19.3 | Develop a web-based Green Urban Design portfolio including a digital copy of the Plan, the yearly progress reports (21.2), the indicators baseline data—metrics and maps—(18.3 – 18.6) and access to the database of Best Management Practice (19.1, 19.2). | DZP | 12/2008 | On-going |
| 19.4 | Incorporate throughout the City's Web Portal links to a Green Urban Design Web portfolio. | DOIT | 01/2009 | 06/2009 |

## ACTION (20) – EXPAND THE CITY'S AND ASSOCIATED SISTER AGENCIES' WORKFORCE CAPACITY FOR ENVIRONMENTAL MANAGEMENT.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 20.1 | Develop and distribute to all relevant staff handouts on GUD issues / principles re-using the information presented in Chapter 2 of the Plan. | DZP | On-going | On-going |
| 20.2 | Develop and implement an on-site training program building upon each of the Green Urban Design Plan Principles:<br>- Set up pre-service training and booklet;<br>- Set-up in-service training programs (including, but not limited to cross-departmental Brown Bags) for all project coordinators and reviewers. | DOE | TBD | TBD |
| 20.3 | Provide off-site training budget. | MO | 06/2009 | On-going |
| 20.4 | Include a "Green Knowledge" evaluation in staff performance review. | MO | 01/2010 | On-going |



## ACTION (21) – UPDATE AND ANNUALLY REPORT ON THE GREEN URBAN DESIGN IMPLEMENTATION ROADMAP.

| | CRITICAL STEPS | LEAD AGENCY | TARGET DRAFT/ PLOT DATE | TARGET COMPLETION DATE |
|---|---|---|---|---|
| 21.1 | Maintain the Green Urban Design Implementation Road Map to reflect completions, modifications or additions to the steps. | DZP | On-going | On-going |
| 21.2 | Report progress on the Green Urban Design Implementation Road Map annually to Chicago City Council. | DZP | On-going | On-going |
| 21.3 | Create a documentation process for regulatory modifications/changes associated with the implementation of the GUD Key Actions. | DOZ | On-going | On-going |

# APPENDIX 2: GLOSSARY

**Adaptation** – The adjustment in human systems, in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

**Baseline** – A measurement that evaluates change in a variable beginning at the established time period.

**Best management practices (BMP)** – Design solutions used to reduce the adverse affects of development, including pollution, the urban heat island effect and stormwater runoff.

**Climate change** – Change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

**Combined Sewer Outfall** – The point where sewage flows out from a conduit or drain. The CSO outfalls to the waterway act as a relief points for the excess flow in the sewers, thereby reducing the frequency and severity of sewer backups and flooding.

**Combined Sewer Overflow** – A discharge from the combined sewer system directly into a stream, river or lake, instead of into the wastewater treatment plant. The discharge may contain some or all of the following: storm water, untreated human waste, industrial waste, toxic materials, and debris.

**Combined sewer system** – A sewerage system that collects both sanitary sewage and stormwater runoff in the same pipe for transport to the wastewater treatment plant for treatment and discharge into a water body.

**Complete Street** – A street that enables safe, attractive and comfortable access and travel for pedestrians, bicyclists, motorists and transit riders. Complete Streets also create a sense of place, improve social interaction and generally improve land values of the adjacent property.

**Compost facility** – A facility that manages decomposition through a controlled process that transforms landscape waste, such as leaves, grass and other organic materials, into products useful as soil amendments.

**Context sensitive solution** – A collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic and environmental resources, while maintaining safety and mobility. The approach considers the total context within which a transportation improvement project will exist.

**Development sites** – Land proposed for development or redevelopment.

**Emissions** – Gases and particles that are released into the environment, including pollutants from burning fossil fuels.

**Environmental performance** – A results oriented approach for protecting and improving the environment and natural resources through the principles of performance, partnership, flexibility and innovation.

**Environmental Scorecard** – A systemic, empirical benchmarking of performance on environmental sustainability. The measures may include: pollution levels, environmental management and protection of global resources.

# APPENDIX 2: GLOSSARY

**Glare** – Brightness from a light source that causes annoyance, discomfort or reduces the viewer's ability to see.

**Geothermal** – Groundwater or steam which is at least 250 degrees Fahrenheit and which is used for its thermal characteristics.

**Green roof** – A planted roof system composed of waterproofing, drainage, soil and plants.

**Green Technology** – The application of the environmental sciences to conserve the natural environment and resources, by curbing the negative impacts of human involvement.

**Green Urban Design** – Environmentally sustainable urban design.

**Greenhouse gases** – Gases capable of absorbing infrared radiation emitted from the Earth; in their natural state these gases regulate the temperature of the Earth.

**Ground water** – Supply of fresh water that is under the surface of the land in an aquifer that forms a natural reservoir.

**Ground-level ozone** – A gas that is a product of a chemical reaction produced by burning coal, gasoline and other fuels. This is differentiated from stratospheric ozone which shields the earth against the harmful rays of the sun.

**Impervious surface** – A surface which substantially precludes the infiltration of water, such as concrete, asphalt, tile or compacted gravel.

**Indicators** – An index that states the exact degree of a specific environmental condition.

**Infiltration** – The passage, movement or percolation of water into and through soil surfaces, including soil surfaces on roofs and in landscaped areas.

**Level of service** –The measure of traffic congestion at an intersection or on a section of road.

**Light pollution** – The adverse affect of artificial light.

**Light trespass** – Objectionable shining of light that illuminates neighboring property.

**Luminary** – A complete lighting unit consisting of a light source and all necessary electrical, mechanical and decorative parts.

**Mitigation** – Compensatory or corrective actions to minimize, reduce or offset the impacts of climate change.

**Non-attainment area** – An area which exceeds the maximum level of pollutants above which adverse health effects may occur.

**Percolate** – The movement of water through the soil layers.

# APPENDIX 2: GLOSSARY

**Pervious surface** – A surface which allows the infiltration of water into the soil.

**Planned Development** – A real estate parcel in the City of Chicago developed in accordance with the planned development provisions of the Chicago Zoning Ordinance.

**Prairie grasses** – Herbaceous, deep-rooted perennial plants which originally existed in open oak woodlands and other habitats in North America before the development of prairies. They colonized the prairie ecosystem after the glaciers receded.

**Public landscape** – A landscape within the city limits that is owned by a unit of local government and that provides for recreation or habitat. This includes Lake Michigan and other waterways, grounds surrounding public buildings and public facilities, but does not include landscapes owned by the State of Illinois or the federal government.

**Radiated heat** – Radiant heat transfer occurs when infrared light leaves the surface of an object and travels to the surface of a cooler object. Unlike conduction and convection, which require a fluid or solid material between the two objects transferring heat, radiant heat transfer only requires a space between the two objects.

**Right-of-way** – An area of land owned by the City for public use for vehicular and pedestrian movement, including highways, streets, alleys, paths, trails and sidewalks.

**RP-8** – The American National Standard Practice for roadway lighting which provides the design basis for lighting roadways, adjacent bikeways and pedestrian ways.

**Sequestration of $CO_2$** – Removal of $CO_2$ from the atmosphere by carbon capture, separation, storage or reuse. The removal process may include retention at power plants, reforestation, storage within geologic reservoirs or agricultural modifications.

**Site plan review** – The City's review of a site plan, maps and other diagrams to assure that a proposed project meets standards in the Zoning Ordinance and Municipal Code.

**Smog** – A mix of pollutants, including ground level ozone, which is produced by chemical reactions in the air, such as the burning of petroleum based fuels including gasoline.

**Soil** – Naturally occurring mineral and organic material on the immediate surface of the earth that serves as a medium for the growth of plants.

**Solar radiation** – Radiant energy emitted by the sun from a nuclear fusion reaction that creates electromagnetic energy.

**Stormwater best management practices** – A measure approved by the Commissioner of Water Management used to control the adverse stormwater related effects of development.

**Streetscape** – The space between the buildings on either side of the street that defines the character and creates the image of the street.

# APPENDIX 2: GLOSSARY

**TARP (Tunnel and Reservoir Project)** – A system of tunnels and reservoirs operated by the Metropolitan Water Reclamation District of Greater Chicago intended to control flooding and water pollution in the Chicago metropolitan area; also known as the Deep Tunnel.

**Urban Design** – A process that combines elements of architecture, planning and landscape architecture to give form, beauty and function to a city through the articulation of its parts.

**Urban forest** – A collection of trees or woody plant vegetation or a forest that grows within or around a city, town or a suburb.

**Urban heat island effect** – A dome of elevated temperatures over an urban area caused by structural and pavement heat fluxes and pollutant emissions.

**Urban tree canopy** – A landscape element that functions as a "ceiling" to create shade from the sun and protection from the rain.

**Volatile organic compounds** – Gases emitted from certain solids or liquids. They are emitted by a wide array of products, including paints and solvents, and may have short- and long-term adverse health effect.

**Water allocation** – The U.S Supreme Court decree that established the maximum cubic feet of water per second that the State of Illinois can divert from Lake Michigan during the period 1980–2020. The decree is supplemented by a Memorandum of Understanding adopted in 1996 between Illinois and the other Great Lakes states. The Department of Natural Resources (IDNR) administers the decree via the issuance of permits to all users of Lake Michigan water.

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# APPENDIX 4: ACKNOWLEDGMENTS


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# APPENDIX 5: ENDNOTES

## CHAPTER 1

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# APPENDIX 5: ENDNOTES

## CHAPTER 2

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